SCIENTIFIC MANPOWER AND EDUCATION

HEARINGS

BEFORE THE

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CENSUS OF SCIENTIFIC AND TECHNICAL PERSONNEL

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SCIENTIFIC MANPOWER AND EDUCATION

Part II—Census on Scientific and Technical Personnel

WEDNESDAY, JUNE 24, 1959

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C.

The committee met at 10 a.m., Hon. Olin E. Teague presiding.

Mr. TEAGUE. The committee will come to order.

Our first witness this morning will be Mr. A. Ross Eckler, Deputy Director, Bureau of the Census.

Mr. Eckler, you have a statement, I believe.

Mr. ECKLER. Yes, Mr. Chairman.

Mr. TEAGUE. You will proceed.

STATEMENT OF A. ROSS ECKLER, DEPUTY DIRECTOR, BUREAU OF THE CENSUS

Mr. ECKLER. I understand that the session needs to be rather short and in the interests of time I thought it might be better if I submit the statement and give a few highlights pertaining to it.

Mr. TEAGUE. All right, go ahead.

(The statement referred to is as follows:)

STATEMENT OF A. ROSS ECKLER, DEPUTY DIRECTOR, BUREAU OF THE CENSUS

The Bureau of the Census, which is the major factfinding and statistical service agency of the Federal Government, collects information periodically on the population of the United States and its homes, on the Nation's farms and factories, and on the establishments for the distribution of goods and services. The interest of this commitee in the problems of keeping track of the Nation's scientific and technical manpower directs our attention primarily, but not exclusively, to the population census, taken once every 10 years, which furnishes detailed information on the number and distribution of the population as well as upon many of its characteristics.

The following sections conform to the questions raised by the committee's letter to the Bureau of the Census.

CONTINUING PROGRAMS OPERATED BY THE BUREAU

Although the 10-year census is the most comprehensive source of information on manpower, it can by no means meet all of the specialized requirements of those who are concerned with our supply of scientists. This is natural, since the census is called upon to furnish so many different kinds of information that only a limited amount of detail can be collected in any particular area.

Whenever we make our plans for a decennial census of population, we must resolve many urgent and conflicting claims for inclusion of questions on the schedule. The compromises finally reached involve a balancing of the importance of the different competing needs, in the light of our experience concerning the kinds of information that it is feasible to collect in a decennial enumeration.

The census questions of greatest interest from the point of view of this committee are those pertaining to occupation, industry, highest grade of school completed, income, sex, and age. Some of these questions, like sex and age, will apply to every individual, but most of the inquiries, including occupation, industry, education, and income, will be asked of one household in four and are therefore called "sample" questions. We shall have an army of about 160,000 enumerators trained to collect the information which is obtained from all households, and a somewhat smaller number (about 60,000) who will be concerned with the sample questions.

We hope that the information on occupation, industry, education, etc., may be improved in this forthcoming census because of the fact that householders will usually have a chance to fill out the information for their own families, consulting as necessary with other members. This use of self-enumeration opens up possibilities for effective publicity through employers and professional groups to encourage workers to see to it that better information on occupation and industry is provided on the census schedules. In many cases, nevertheless, the person supplying the information as well as the person writing it down may not have a very good understanding of the kind of information requested in the census, or the kind of work performed by an individual, and the description shown on the census schedule may not be entirely correct. These shortcomings could be significant when we attempt to make some of the finer distinctions among scientific and technical occupations. On the basis of our experience over the years, we believe that we are pushing the distinctions about as far as we can in a mass enumeration, and we try to make it clear to our users that the precision of reporting and classification sometimes is not as satisfactory as could be desired.

Our plans for the 1960 census call for presenting statistics on the numbers of individuals classified by age, sex, education, income, recency of work experience, and other characteristics for several hundred different occupations. There follows a list of the specific occupations to be provided for classifying professional, technical, and kindred workers. (Various additional subgroups may be identified but publication will depend on the validity of the results:)

Accountants and auditors
Actors and actresses
Airplane pilots and navigators
Architects
Artists and art teachers
Athletes
Authors
Chemists
Chiropractors
Clergymen
College presidents, professors, and instructors (n.e.c.)
Dancers and dancing teachers
Dentists
Designers
Dietitians and nutritionists
Draftsmen
Editors and reporters
Engineers, aeronautical
Engineers, chemical
Engineers, civil
Engineers, electrical
Engineers, industrial
Engineers, mechanical
Engineers, metallurgical, and metallurgists
Engineers, mining
Engineers, sales
Engineers (n.e.c.)
Entertainers (n.e.c.)
Farm and home management advisers
Foresters and conservationists
Funeral directors and embalmers
Lawyers and judges
Librarians
Musicians and music teachers

Natural scientists (n.e.c.)
Nurses, professional
Nurses, student professional
Optometrists
Osteopaths
Personnel and labor relations workers
Pharmacists
Photographers
Physicians and surgeons
Public relations men and publicity writers
Radio operators
Recreation and group workers
Religious workers
Social and welfare workers, except group
Social scientists
Sports instructors and officials
Surveyors
Teachers, elementary schools
Teachers, secondary schools
Teachers (n.e.c.)
Technicians, medical and dental
Technicians, electrical and electronic
Technicians, other engineering and physical sciences
Technicians (n.e.c.)
Therapists and healers (n.e.c.)
Veterinarians
Professional, technical, and kindred workers (n.e.c.)

The count of workers in some of the technical occupations can be somewhat refined by means of data on education, income, and age. We identify those who have completed various numbers of years of high school and of college, as well as those who have had 1 year of graduate school and those with 2 or more years of graduate school. Information on income during the preceding year and on age, will also make it possible to refine and evaluate the results.

In 1960, for the first time, this detailed information on occupation on a sample basis will be available not only for the current labor force but also for persons now outside the labor force who worked in the past 10 years, that is, the so-called labor reserve.

A second continuing program operated by the Bureau of the Census is a monthly survey called the Current Population Survey, in which 35,000 households are visited for the purpose of collecting information on employment status, occupation, industry, and other subjects as appropriate. This sample is not sufficiently large to make possible the tabulation of detailed statistics on professional manpower. It does, however, yield statistics on workers in the following three categories:

Medical and other health workers
Teachers, except college
Other professional, technical, and kindred workers.

On July 1, 1959, the responsibility for content, analysis, and publication of labor-force data from this survey, including the occupation and industry information, will pass to the Bureau of Labor Statistics as the result of an interdepartmental transfer and reorganization of functions.

A third continuing survey operated by the Bureau is the survey of research and development expenditures by industrial companies being carried out for the National Science Foundation. As collecting agent for the National Science Foundation, the Census Bureau collected figures on total scientists and engineers engaged in industrial research during January 1957 and 1958, and this is to be continued as an annual program. These figures were turned over to the Foundation together with other data collected. In a survey on research and development costs for 1958 that the Census proposes to collect for the National Science Foundation, the January 1959 data on scientists and engineers in research and development, will be collected primarily for the purpose of evaluating cost figures and will be tied in to the results of a broader manpower inquiry conducted by the Bureau of Labor Statistics.

DATA PROCESSING METHODS OF POSSIBLE USEFULNESS

It is quite likely that the processing and other facilities of the Bureau could be used in a variety of ways for developing or carrying out the programs in which this committee is interested. For example, we have specialists who are thoroughly familiar with the problems of sample design, planning of surveys, development of processing specifications, and preparation of tabulations and publications. Our field organization can be readily expanded to provide for special canvasses of samples or segments of the population. Our tabulation facilities, including modern large-scale and highly versatile electronic tabulating equipment, are well-designed to compile detailed and complex data in an expeditious manner. Members of our staff are frequently called upon for consultation on a wide variety of problems and we are, of course, always ready to contract to furnish assistance on tasks within the range of our capabilities.

PLANS FOR 1960 CORRELATED WITH OTHER GOVERNMENT PROGRAMS

Our plans for occupational classification in 1960 are correlated with those of other Government agencies through an interagency committee of the Bureau of the Budget. In particular, we are striving to get improved detail on engineers, technicians, and teachers. Furthermore, a representative of the Bureau has served as consultant to the Advisory Panel to the President's Committee on Scientists and Engineers and National Science Foundation.

It may prove desirable after the 1960 census to follow the 1950 program of preparing a special deck of 6 million punchcards or, in terms of our new facilities, a special magnetic tape file, from which additional details on the characteristics of groups of workers in particular occupational categories may be obtained efficiently. If such supplementary information were provided through the cooperative efforts of interested agencies, it might serve as a rich source of special data on the characteristics of particular types of manpower, such as those in scientific and technical occupations.

PROGRAMS THAT MIGHT BE UNDERTAKEN BY THE BUREAU

In a previous section there was a description of the facilities of the Bureau for processing work and for related statistical activities such as collection, tabulation, publication, and analysis. The experience and facilities of the Bureau could logically be called upon for a considerable variety of undertakings involving the collection and compilation of statistical data based upon samples or segments of the population. It is probable that the strong and direct concern of a number of agencies, such as the Civil Service Commission, the National Science Foundation, and the Departments of Labor and of Health, Education, and Welfare, would suggest that the Bureau could most appropriately be used in a service capacity depending for guidance and direction upon other agencies especially qualified to deal with the problems of scientific and technical personnel. As an example of work which might be done by the Census, a study of engineers is being made in cooperation with the National Science Foundation, using current population survey records. This is a pilot study designed both to help evaluate current estimates of engineers and to prepare for a proposed more comprehensive survey subsequent to the 1960 census. The more extensive study, which might cover all college graduates regardless of their present occupational attachment, was given "urgent" priority in the recommendation of the previously mentioned Advisory Panel to the National Science Foundation and to the President's Committee on Scientists and Engineers. Similar studies of other specialized occupation groups could be undertaken, using decennial census and other available records as the primary source.

Mr. ECKLER. I may say I am pleased to have an opportunity to come here. The Census Bureau is interested in the work of the committee for two reasons. First because its material is used very extensively for many of the inquiries as to scientific and technical people, and second, because we are concerned ourselves with the supply of certain engineers and social scientists, statisticians, and others.

I would emphasize there are a great many different uses of the census for the purposes in which this committee is interested. I have a

report entitled "A Program for National Information on Scientific and Technical Personnel," which was issued by the National Science Foundation and the President's Committee on Scientists and Engineers. This report is replete with references to different phases of work of the census which bear upon the matter of supply of technical people. I am not going to try to cover all of those. In my statement I have addressed myself primarily to the points which were in the letter which the committee staff sent to Mr. Paul Squires of the Bureau of the Census.

First of all I want to mention the phases of our work that involve collection of information that bears upon this problem. The most important body of information is that represented by the decennial census of population where among other subjects, we get information on occupation, industry, income, highest grade of school completed, age, and sex.

Now this information in combination gives a great deal of valuable material for studying the supply of professional and technical people. In the statement I have given a list of the categories under which we classify these people, and these classes, of course, may be combined with information on education and income and other features so that we can furnish a quite detailed picture regarding the manpower in this field. We are, of course, glad to cooperate in any way possible to make these materials as useful as they can be for the purposes in which the committee is interested.

Another one of our continuing programs which bears upon this is our current population survey which is a sample of 35,000 households that we interview once each month and from them we get information on work status, occupation, industry, and other subjects.

Now that sample, of course, is not large enough to give details on some of the smaller occupational categories and there are only three in the field that this committee is interested in that we do try to report regularly, but the survey as a whole can be used for various kinds of special inquiries that might bear upon this problem.

Another area of work which we carry on is a job which we do for the National Science Foundation on research and development expenditures by industrial firms. In connection with this survey we get information on the number of scientists and engineers.

Mr. TEAGUE. Mr. Eckler, when was that last survey made, 1958?

Mr. ECKLER. We are planning one for 1958 that is being discussed. There was one done for 1956 and 1957.

Mr. TEAGUE. But not for 1958 yet?

Mr. ECKLER. No, not yet, that is in the discussion stage now. Plans are being developed and I trust that they will work out to a project along that line.

Mr. TEAGUE. I should think that would be information that the committee would be very much interested in, particularly my Subcommittee on Research and Development.

Mr. ECKLER. Yes, but the amount of information on numbers of persons will be rather limited. It will be primarily on expenditures. I believe that the Bureau of Labor Statistics does a rather more extensive inquiry into the numbers of technical people not only in research and development but in other phases of the company work. Well, those were the types of continuing work which I thought worth mentioning in brief.

Another question which was raised by the committee concerns the facilities which we have that might be useful, notably processing facilities. We believe that as a general purpose statistical agency we have rather effective facilities that can be used for a wide variety of statistical purposes, facilities for the collection of data, and tabulation, for which we have very modern electronic computing equipment. We have specialists in sample design, specialists in survey planning and so on, so that we do present ourselves as being equipped to do on a contract basis a very wide variety of tasks involving collection, compilation, and analysis of mass bodies of data.

A third question which the committee raised pertained to work which we are doing in adjusting our program to the needs of other agencies, the planning for 1960. I would mention that we are working with an interagency committee of the Bureau of the Budget on the occupational classification of persons who are returned in the census in order to make that classification as useful as possible within the limitations of the data themselves.

We are ready to consider the possibility that after the 1960 census there might be developed a special file, or in the case of our new equipment, what might be called a magnetic tape file which would contain information on all of the persons in certain categories that might be of interest to this committee and to the various specialized agencies that are concerned with manpower problems. We did that after the 1950 census. I believe it is a very useful source of information and it seems quite likely that a similar job might prove useful in 1960.

Mr. MOELLER. May I ask a question?

Mr. TEAGUE. Mr. Moeller.

Mr. MOELLER. Mr. Eckler, how many requests for this type of information do you get, let us say in a week?

Mr. ECKLER. Mr. Congressman, I would like to refer that question—I should have introduced my colleague, Mr. David L. Kaplan, our specialist on occupation and industry statistics.

I would assume the number of requests would be very small but that when we do have requests from an agency which participated in this it would be for a quite important purpose. Mr. Kaplan, would you——

Mr. MOELLER. Well, let us just say you started this in 1950, right. Now since 1950 up to this date, is there a regular search of your statistics for information, or is it sporadic?

Mr. KAPLAN. In terms of special information this is sporadic because this frequently involves substantial sums of money to obtain this information, but we also get requests for unpublished information we may have on hand from our regular tabulations. Also we get requests from people who cannot readily find in our published materials what they are looking for and we point out to them exactly where and what is available. So, there are different types of requests that come in, some more frequent than others.

Mr. MOELLER. It seems as though you must have gathered, however, quite an array of information that maybe not too many people are making use of?

Mr. ECKLER. Mr. Chairman, I believe the numbers of uses are very great. One of our problems is to broaden the knowledge, public knowledge, of what we have and how it might be used.

Mr. MOELLER. There might be people who are not aware of the fact that this information is available.

Mr. ECKLER. There is no question of that, Mr. Congressman. We do not get our information across to many people and industries who should utilize it.

Mr. TEAGUE. Mr. Fulton.

Mr. FULTON. May I ask a question about the list of groups, professional, technical and kindred workers. For example, on page 3 there is "entertainers (n.e.c.)" and then there is on page 2, "college professors, presidents, and instructors (n.e.c.)"; then on page 3 there are "therapists and healers (n.e.c.)."

Will you please tell me what that means. I am surprised they are of the same order. Why are they grouped together under n.e.c. and what is that?

Mr. ECKLER. I must apologize for having this bit of what might be called gobbledygook. N.e.c. are initials we frequently use for "not elsewhere classified," and I should have had that spelled out. Very often we will have certain parts of a category identified and then we will have a catchall or remainder for those who are not specially classified.

Mr. FULTON. I wondered what an actress and a healer might have in common with a college president.

Mr. ECKLER. Very little except when they come in this broad category.

Mr. TEAGUE. Mr. Eckler, in this inquiry for 1960 census of population, suppose people do not want to answer those questions?

Mr. ECKLER. Well, Mr. Chairman, the law requiring answers is very specific. Penalties are provided for those who refuse to answer them. We find by experience that numbers who object are very, very small indeed. We will occasionally find a person who has not heard about the census, thinks this is prying or something like that, but the numbers are small. Usually after it is explained what the reason is, how important it is, we get cooperation.

Mr. MOELLER. Mr. Chairman, may I ask another question?

Mr. TEAGUE. Mr. Moeller.

Mr. MOELLER. How many people are involved in preparing this information?

Mr. ECKLER. The total number of people who are involved in the fieldwork for the census of population and housing is about 170,000 or 180,000. That is a very short-run employment, of course.

Mr. MOELLER. Now these 170,000, of course, are not primarily seeking this information?

Mr. ECKLER. They would all get a little of this.

Mr. MOELLER. Well, how many do you have that are specifically assigned to gathering this type of data?

Mr. ECKLER. Well, we have a questionnaire which includes this and a great many other subjects, so the 170,000 all would do something with this.

Mr. MOELLER. The question in my mind is whether there are a lot of people involved here doing something that nobody is making use of, or that not many people are making use of.

Mr. ECKLER. Well, I should not want to agree, Mr. Congressman, that there are not very many. I think that the total number of users

of census statistics is really very great. Many of them do not realize they are using census data. The data are republished. They appear in local atlases, yearbooks, compilations put out by newspapers. They are published very widely in the press, magazines, technical journals. As far as our own bulletins are concerned, the numbers published are only a few thousand per bulletin so that that does not go to such a tremendous number, but the reprinting of this in the press, and so forth, and its use in schools, and so on, means that the data are actually used by large numbers, and yet I agree with your implication. I think that by no means as many people use it as ought to. We find many cases of members of business firms that we think ought to know about the figures and use them and they do not.

Now more and more people are getting acquainted with the importance of statistics, information about the population, about its homes, and so on, so that the use is broadening, but——

Mr. MOELLER. Well, do Government agencies make use of it?

Mr. ECKLER. Yes, there is tremendous use in Government agencies. I think in most congressional reports, reports of committees, and so forth, you would find if you wanted to clip every page where census figures are used, you would be surprised at the number of pages clipped. We sometimes go through this to satisfy ourselves. A publication like the World Almanac might be—well, certainly it is full of census figures. I was going to say perhaps a quarter or a third of the pages would be accounted for by census material so that the uses are very extensive and yet it is true that we would like to see lots of people use them that do not know about them fully, and one of our problems is to get that information across.

Mr. TEAGUE. Mr. Anfuso.

Mr. ANFUSO. Mr. Eckler, I notice that in your classification of professions and vocations you list social scientists. Is that the only way you have of classifying scientists?

Mr. ECKLER. No, sir, we have natural scientists also, but this group of social scientists does include a variety of different occupations which we believe we could not identify very consistently in a mass enumeration.

For example, economists would fall in there, psychologists, statisticians and actuaries, and miscellaneous social scientists.

Mr. ANFUSO. Are they later broken down into those specific classes?

Mr. ECKLER. They would not be in the regular census report, Mr. Congressman, no.

Mr. ANFUSO. That would also apply to the natural scientists, is that right? What does that include?

Mr. ECKLER. Under that we would have agricultural, biological scientists, geologists, geophysicists, mathematicians, physicists, and then miscellaneous natural scientists.

Mr. ANFUSO. Mr. Eckler, just one final question. You know we in New York have always been the largest populated State—if not the largest State in area, like my good friend here from Texas, although Texas has acceded to Alaska but still Texas is the largest unfrozen State. In New York we are still the largest populated State.

I have some good friends present here this morning from California. We are fearful that California some day will have a much

larger population. Is there any way of tampering with the census so that will not come about? You do not have to answer that.

Mr. ECKLER. I share with you the interest in that subject because I am a native of New York State.

Mr. ANFUSO. Fine, we have something in common.

Mr. ECKLER. So far I have not found any way to do anything about this.

Mr. TEAGUE. Do any other members of the committee have questions? Mr. King.

Mr. KING. I got in a little late, and maybe you have answered this question, but as the census takers go around and get this information, naturally they cannot get everybody, obviously, some people are just too elusive to be able to nail down at a given point of time.

How do you take into consideration those that you do not get; do you get that information from those that you do get, asking them questions about their entire family and thus reaching out presumably, taking in everybody?

Mr. ECKLER. Congressman, we do indeed have difficulty in getting information from one-person households where you have to reach that person or two-person households where both the husband and wife are working. Sometimes after repeated calls we will get information from neighbors or from apartment house managers or some other source of that sort. We do the best we can. We ordinarily would not get it from other members of the family since they would be scattered geographically.

On the whole it works best to get it from someone that lives close to these people. We also would make some use of forms which are left at the door with a little explanation that the census taker has called two or three times. We ask if they will fill out the form and mail it in. This time we are making more use of the principle of self-enumeration, allowing the persons to fill out their own forms and in the case of the detailed information on occupation, industry, and so on, we are asking them to mail it in to a census office.

Mr. KING. Let me back up just a minute. Let us assume there is a large family, a father and mother, six or eight youngsters, some of whom are old enough to be out working themselves.

Mr. ECKLER. But living at home?

Mr. KING. Yes. All right, you call on the mother, you get all of the data pertaining to that family; is that right?

Mr. ECKLER. Yes.

Mr. KING. You get the statistics on the father and the children who are at work, the children who are at school and——

Mr. ECKLER. Well, we do. In the first case there is information which is asked of every person and that would be gotten at the time of the first interview.

Mr. KING. But is the mother the source of information about the father and about the children?

Mr. ECKLER. About the hundred percent information, that is age, sex, color, marital status. Then we leave a form that has a more detailed series of questions, and that will include this occupation, industry, and so on. We leave that with the family in one case in four.

Mr. KING. Pardon me just a minute. These questions on sex and color and so on, does that apply to every member of the family or just the person you are talking to?

Mr. ECKLER. That applies to every member of the family and the mother supplies it for everyone.

Mr. KING. All right, so the mother becomes the source of information to the census taker for the father and the children and everybody else connected with the family.

Mr. ECKLER. That is right, Mr. Congressman, and there is one additional point that I would like to make, that we are going to mail this form in advance to every household so that there will have been a chance to fill it out in advance. We hope that the mother if she has any uncertainty about any of the information there would consult with other members of the family so as to get it accurate before the census taker comes. If she has not done that, then the procedure that you have mentioned is the one that is followed. The mother if she is at home will answer those questions for every member of the family.

Mr. KING. One final question. There are in the country a tremendous number, and I would have no way of knowing how many, but they are transients or shall we call them bums, but they have disassociated themselves from any fixed abode or domicile of any kind. You have victims of amnesia that are wandering around without roots anywhere, there is a surprising number of them; you have fugitives who are deliberately concealing their identity and simulating somebody else, and you get all kinds of complications and variations from the usual pattern.

Now my question is how would you take care of them? How would you take care of the bums, for example?

Mr. ECKLER. Well, the major approach, the major attack upon that is a kind of roundup that we call a transient night or T-night survey. I think we are scheduling it this time for the night of March 31, just before the census date. At that time we have special enumerators who are going to visit all of the places where we think that kind of person is likely to be, missions, for example, flophouses, cheaper lodging houses in general, transient places like motels, hotels. If we are anyplace where they sleep outdoors in the parks and congregate, we try to round them up there. So we try to round up that group at that time.

Now that is not a perfect operation, I am willing to concede. We do the best we can at that time, but there are some that will slip through that we will not get, but we think we do about as well as could be done in rounding up that class.

Mr. KING. Could you not get at that class by interrogating other members of their family? In other words, you call on a woman and she might say "Well, I have a brother who is somewhere out there; we do not know where he is, but he is around," and in that way you would keep track of this man who otherwise had no roots at all anywhere?

Mr. ECKLER. It would be a very uncertain operation to ask the enumerator to ask every family, "Do you have anyone else who is more or less footloose that might be missed altogether?" I am afraid that the enumerators would be not inclined to do that consistently.

In some cases the family would not report this person. They are a little bit ashamed of the fact that this person is rambling around; they do not know just where, and even if the wife—not the wife, but maybe a sister or someone like that—would report such an individual,

they would not know where he was. So all we would know would be that somewhere in the United States there might be a footloose person that you should add to the total. So I do not think it would be as good an alternative as the device of trying to catch the people at the places where they are found. It has seemed to work. As a matter of fact, the Canadians, who in many cases have the same problems that we do, follow exactly this same procedure, and it seems to work fairly well in both countries.

Mr. KING. That is all I have.

Mr. TEAGUE. Mr. Fulton.

Mr. FULTON. The question comes up of duplicating and overlapping. For example, in a city like Washington there are people who are here working who do not consider this their home. They consider their home as back in another State. So the mother says "Yes; I have a son and a daughter working in Washington," and then the census enumerator in Washington goes around and sees these people and they say "Oh, we have been here 8 or 10 years and we never expect to go back."

How do you sort those things out?

Mr. ECKLER. We try to enumerate on the basis of usual residence, where the person is most of the time.

Mr. FULTON. So that, really, that person would be a resident of the District here?

Mr. ECKLER. Yes; of Washington. We would expect in general that the mother back in some other State would not report the person typically, because the enumerator would approach this family with the question "Who was here on April 1?" In fact, the form which is mailed in advance asks for the people who were there on April 1, and I think it would be unusual for these people who are away in Washington or some other place to work to be reported at all as residents of the place they come from. Now there could be an occasional instance of that, but I think on the basis of a postenumeration check, after the 1950 census, to see how much accuracy we achieved, we have found very, very few cases of duplication.

Mr. FULTON. Then the question comes up on the migrant Mexican workers. How do you handle that? Do you put them at the point of entry or the first point of enumeration or do you put them where they might have landed with a jalopy in Minnesota, working their way through the various crops as they go north through July and August?

Mr. ECKLER. We would get them where they are as of the enumeration date. If they have landed and are actually working at some farm as of that day we would get them there.

Mr. FULTON. So that it is the point on a particular day rather than a permanent location.

Mr. ECKLER. That is correct.

Mr. FULTON. The next group is getting very large and that is the trailer people who live in trailer homes. Where do you put them? Do you put them just at the point you get them or do you allocate them to the point of origin or the point where their car is registered?

Mr. ECKLER. There would be several kinds. Many of these trailers are settled down into villages. They are semifixed so they would go there as a part of the resident population.

Mr. FULTON. But suppose you go along and see a Pennsylvania, New York, and California license. They say, "Well, we are working here now but it is just for the past few months."

Mr. ECKLER. We would count them as part of that community.

Mr. FULTON. But if they are transients——

Mr. ECKLER. If they were transients and we found they were traveling for pleasure, sleeping one night one place and another night another, and there is a regular place they are going to go back to as their home, we allocate them there.

Mr. FULTON. My next question is on page 25, veterans' status. I am asking as to the necessity for that question. For example, it refers only to men and not to women who might have been in the service, and secondly, it would look to me to be getting information from a secondary nonofficial source when I think our good friend Mr. Teague would tell you that we have all that information officially in the Government records anyhow. Why get it from an inaccurate secondary source under these conditions and then why have it only partial?

Mr. ECKLER. Mr. Congressman, first as far as the information pertaining only to men, the number of female veterans is fairly small, less than a half million.

Mr. FULTON. But I would say they are fairly important.

Mr. ECKLER. Yes, sir; I am not denying the importance of female veterans.

Mr. FULTON. You should have an overall look at it and you should have all veterans.

Mr. ECKLER. I might say that this question is on the schedule because of the very considerable interest and concern expressed by officials of the Veterans' Administration. Of course as I indicated before we are a service agency which attempts to plan all of its programs in the light of the great variety of users. In this case it is the Veterans' Administration that has strongly urged this. The decision on limiting it to men is in accordance with their views. Now, as to the fact that this is a secondary source of information and you do have a count from the Veterans' Administration, I think the primary point is that they are interested in the present distribution and in their characteristics, the occupations that they are in, the education that they have attained, the work status, how many are employed, how many are looking for work, the family composition, the income of veterans relative to nonveterans and other subjects of that sort. It is that kind of information which is available from a census that is not available from the administrative records of the agency.

Mr. FULTON. Why do you do it by particular periods of service rather than by age group or physical points? Why do you put it World War I, World War II, Korean war, and so on?

Mr. ECKLER. Your point is that the age classification would tell you about the same?

Mr. FULTON. It would tell you more I believe because there is a certain overlapping.

Mr. ECKLER. There would be a certain overlapping and again I believe that is in accordance with what the Veterans' Administration has been interested in getting. There is this advantage probably in having the different wars mentioned, that you come closer to getting a complete count if you mention all those. It could be that some of

the veterans of earlier wars would not get reported and by listing them all you get a more nearly complete count or you remind them of the fact, for example, he was in Korea, which they might have forgotten otherwise.

Mr. FULTON. You see on the floor of the House we have been told the figures of these various classes authoritatively from Government sources in respect to veterans pension legislation.

Now if that is adequate, then we do not need question 25. If it is inadequate then we should know it.

Mr. ECKLER. Well, Mr. Congressman, I hesitate to comment upon the adequacy of the information from the Veterans' Administration. I could conceive that the numbers that they have there are sufficient for the purposes of legislation and also that the additional information on characteristics would be useful for other programs of the Veterans' Administration or would provide background for some of their recommendations.

Mr. FULTON. Now as a matter of accuracy it would seem to me that the governmental sources upon which the Government is acting on the settling of rights, obligations and duties would be a much more accurate premise than one that is just casual by one member of a family on what she thought her Uncle Joe did.

Mr. ECKLER. I should agree with you on that, sir. The great value of this is, I believe, not to give an authoritative count of veterans. I would defer completely to the administrative records of the Veterans' Administration. The value here derives completely from the combination of information that you get. Let us suppose our number is somewhat smaller, which I think it is. The characteristics shown for our number are probably applicable to the larger number which appears in their files and hence can be a basis for their policies.

Mr. FULTON. In closing could you tell us how they take the census for institutions and for people who are not competent?

Mr. ECKLER. Yes, sir.

Mr. FULTON. And also how they relate to people who are in the service now and might be away from home?

Mr. ECKLER. Well, Mr. Congressman, typically as we deal with groups who are in institutions we designate officials of the institution, persons already there, to carry out the canvass. If the inmates are incompetent, mentally incompetent, so that they could not answer questions, then, of course, it would be furnished from the records of the institution and some of the questions pertaining to income and occupation and industry would not be applicable.

In other kinds of institutions it is possible to arrange for an enumerator to go from room to room to canvass the people. We try to adjust the arrangements to the kind of institution and the requirements for handling of patients or inmates. In the case of the Armed Forces overseas or at other points, that would also be done through their channels, that is we would try to have some officers who would be responsible for carrying it out and they would distribute the forms, and collect the information with instructions from us as to what the procedures are.

Mr. FULTON. For example, in Lewisburg, Pa., we have the Eastern Penitentiary. Are those people listed as citizens of Lewisburg or are they related back to their homes?

Mr. ECKLER. They are citizens of Lewisburg. They are there for quite a stay usually.

Mr. FULTON. So you would then say that Lewisburg has so many citizens even though they are in the penitentiary there and it is probably almost the same number that are living outside the walls?

Mr. KAPLAN. We use the term "residents" rather than "citizens." I would like to offer just one comment on the Armed Forces.

We make arrangements with the Department of Defense on the enumeration of military reservations and such arrangements are now in the process of being completed. Defense will take care of the distribution of certain forms and the collection of that information for us.

Mr. FULTON. How about abroad, how do you get them?

Mr. ECKLER. That is a matter of some difficulty. Those who are working abroad in various Government agencies can be gotten through their agency channels and forms can be gotten to them in that way, and likewise the Armed Forces abroad.

Now, in addition to that we have people who are traveling abroad on business or for pleasure and we try to locate those through embassies and try to get forms to them. In some cases if there are members of the family at home, we can get the information about them here, but in other cases the entire family is traveling and we do the best we can through embassies and other channels like that to get forms to them.

Mr. TEAGUE. Mr. Moeller.

Mr. MOELLER. Mr. Eckler, I was not going to go into any individual questions but Mr. Fulton started this and I would like to go to No. 16. Why do you need to know the fertility of these women? I can think of some nations where this might be a good question. I think, for example, in Japan where they have had radioactive fallout, but why do we in the United States need to know this?

Mr. ECKLER. Mr. Congressman, there is a great deal of interest in projections of what the population is going to be in future years, in studying the patterns of growth among different social and economic categories, and it is through the examination of these records on fertility of women that we are able to make better estimates of what the prospective trends are in this country. We have had some very great changes in our growth patterns. The projections that were being made 15 years ago look rather bad today and we find that the fertility patterns may change a good deal and our experts are placing a great deal of pressure upon us to have information to enable them to project better and understand better what is going on in the way of population change in this country.

Mr. MOELLER. Now, I have another question. When you talk about the mother tongue used by these people, since we here today are so interested in what is happening in Russia and we need people who can handle the Russian language, why do we not inquire about the number of people who can handle the Russian language?

Mr. ECKLER. We have had some pressure to get ability to handle a variety of languages. It is a candidate for inclusion in a census certainly, but it is not believed that it would be as useful as some other things which we have. This mother tongue question does give the skills for those who were born in Russia or other countries, but

does not give second generation people and others who have learned it. It would be a rather complex and troublesome question to ask and there are so many variations of knowledge of a language; that is people may claim it but actually have a very superficial knowledge of it. So we believe that a census might not be the best source for that kind of information. This was put into quite an extent to improve information on our foreign born, to identify certain kinds of groups that would get lost otherwise, such as the Ukrainians and the Slovenes, Croats, and others.

Mr. MOELLER. Now, may I ask another question. Does the FBI make use of this facility?

Mr. ECKLER. Mr. Congressman, under the law it may not be made available for the purpose of investigation of facts about an individual.

Mr. MOELLER. All right, another question: You provide a lot of this information for World Book or what is it called?

Mr. ECKLER. The World Almanac.

Mr. MOELLER. And then they turn around and sell it. Why does Uncle Sam not sell this?

Mr. ECKLER. The real problem I suppose is that we do not have a copyright on Government information.

Mr. MOELLER. Well, they have got a corner on a good deal.

Mr. ECKLER. Well, we do have—my colleague reminds me that we have a publication in which we publish a great deal of information. We do not sell more than a fifth as many copies as the World Almanac, but our Statistical Abstract is the source of a great variety of information.

Mr. MOELLER. My final question, getting back again to the use of this information, what do you do to sell this idea? How do you disseminate among people the fact that this information is available through your Bureau? I did not know that I could come to you and get this.

Mr. ECKLER. Well, I am very happy that you found out.

Mr. MOELLER. Now, how do you tell other people?

Mr. ECKLER. We have a rather small information office which has as one of its important purposes getting public awareness of the fact that a census is coming so that people know that they are going to be asked questions and they know that it is important and that they ought to cooperate and it will not be used to their disadvantage and so on. This office also works with representatives of magazine, newspapers, radio, TV, and so on, and we really do have a vast amount of publicity. We have stories that are coming along, I think they are developing in Reader's Digest, Saturday Evening Post, and other national magazines, about the forthcoming census. We work in every way possible to get this before the people. We appear in association meetings to tell people. We circulate material to trade associations. Many of them circulate special reports to their members.

We work extensively with librarians all over the country, to get the information in their hands. There are cooperative arrangements with chambers of commerce in a great many cities.

The Department of Commerce has 30 or 40 field offices. I visited one just the other day, where people are coming in and they are being told about census reports and so on, but still it is moving more slowly than I wish it were. I think we are becoming a more statistically

minded people and I think the uses of statistics by marketing people and businessmen and Government officials and so forth, are increasing rapidly and yet they fall short of where I wish they were.

Mr. TEAGUE Mr. King.

Mr. KING. I have had, I am sure, 10 or 15 people make inquiry as to securing employment to help in this 1960 census. What is my answer?

Mr. ECKLER. You are thinking of the field end?

Mr. KING. Yes.

Mr. TEAGUE. Shall I answer that? Let him go see the Republicans in his county.

Mr. KING. That is what I have been telling him.

Mr. FULTON. Of course the Republicans are following the system set up by the Democrats in 1950.

Mr. HALL. I have one question. In States such as Florida where people go to spend the winter and their residence is there on April 1, is their residence related to their home State, the State of which they are citizens, or does it count in the State of Florida?

Mr. ECKLER. Well, I think the typical person who is down there for several weeks for a vacation will get reported back.

Mr. HALL. You think they will?

Mr. ECKLER. It depends on how they respond. If they are in a hotel or transient place, we will get their usual residence on the form and allocate it back, but if the person presents himself as a usual resident of Florida, if he is there for 3 or 4 months, including April 1, I think he is likely to stay there.

Do you want to add a bit, Mr. Kaplan?

Mr. KAPLAN. I might add a thought. There are a number of people in a place like Florida who have no usual place of residence, who will spend maybe 3 or 4 months in Florida and maybe spend 3 or 4 months in the West and then go up North with their children. Such people who have no usual place of residence are listed and kept in the place where we catch them on April 1, so some of the hotel people, some of the people staying in hotels in Florida on April 1 will be counted as Floridians.

Mr. HALL. Well, I believe there will be a reapportionment in the House after the next census, so I am vitally interested in that.

Mr. MOELLER. Will the gentleman yield there?

Mr. HALL. Just a moment, if I may. I live in a resort area. I live in the mountains of western North Carolina. Will we receive credit for those people who have small summer cottages up there who get there early enough to be counted as of April 1 even though they may live in Georgia or South Carolina or Virginia or Florida?

Mr. ECKLER. One of the problems we encounter and which I think is going to be getting worse is the number of people who have two homes. They have a home in the mountains somewhere and they spend a good deal of the summer there and they work the rest of the year somewhere else.

Now I think a person like that can probably elect either way on the form. If he thinks of himself as being a resident of Atlanta but just in the mountains temporarily for a limited time, he could say "Well, my usual residence is back there, that is where I work 10 months of the year." But if he likes the idea of being a resident

here, and does not say anything about the other location, he is going to be a resident of North Carolina.

Mr. HALL. Well, if he is not instructed as to a choice of residences, then I assume that the enumerator will put him down as a resident of the place where he is located.

Mr. ECKLER. If he is living there when the enumerator comes and asks how many people are living here, and he starts to list them, he will record them as local residents, for he is not instructed to ask everyone whether there is some other place that he ought to be listed. When a person responds that he is living there with his wife and maybe a youngster and it seems to be a regular home, there is no reason why a question should be raised as to allocating him to some other place, so that the more we get these two-home situations, the more this kind of problem arises.

Mr. MOELLER. Well, I was going to tie this in with what you mentioned before with respect to the fugitive. You somewhere try to get him enumerated, do you not?

Mr. ECKLER. Yes, sir.

Mr. MOELLER. Now you also said before that you are not allowed to give information on anyone. You could not help the Justice Department with respect to a fugitive?

Mr. ECKLER. No, sir.

Mr. MOELLER. What is it good for?

Mr. ECKLER. I think maybe it would be well to make clear. We have mandatory powers of collecting information in practically all of our censuses. Now when we have mandatory powers there is tied to that an assurance to the citizen that the information given will not be used to his detriment. Information pertaining to an individual or to a farm or to a company cannot be used for purposes of regulation, taxation, prosecution, or anything of that sort. If we did not give that protection, the whole system of statistics would be greatly penalized because people would refuse to answer. They would feel that the information would be used against them, so they would give erroneous answers, answers that they are willing to have used. In some countries there are at least two sets of records, one for the tax collector and another for their own use, so we would have a report for the census taker different from the facts, so that protection from disclosure is important.

Now the information is used in summarized form, for taxation and for lots of other purposes, but the information on an individual may not be so used.

Mr. HALL. I have one more question, Mr. Chairman. How do you get these people who are on the highways on a particular day when you are taking the census, on April 1; for instance, there must be 10 to 15 million people on the road at any time or in planes or trains between 6 or 7 o'clock in the morning and 10 or 11 o'clock that night.

Mr. ECKLER. Well, Mr. Congressman, many of those are on just very short trips, such as going to work, or other short trips. In a great many cases there would be someone at home to report them.

Mr. HALL. In the event there is no one at home?

Mr. ECKLER. That might be one of the cases where we would have to call back the next day or 2 days later to see who lives there.

Now, there are other people who are on a vacation trip, the whole family is out on the road, we hope that we will get those through this dragnet on March 31, at which time we descend upon motels and hotels, and they presumably are going to stay somewhere. Now, if this person who is traveling from place to place stays with one friend one night and then moves on to another city and they have a cousin there and they stay there the next night, there are real problems there. The only place you would get them would be back in their home, unless your enumerator happens to catch the family where they are visiting, in which case we would get them as visitors. But we might miss them, and we would have to depend on getting them back at their regular homes, perhaps through information provided by neighbors.

Mr. TEAGUE. Dr. Eckler, one question. What about the college students, what about the single student, the married student, undergraduates, postgraduates?

Mr. ECKLER. Mr. Chairman, the rule on college students is that we enumerate them as of the place where they are attending college.

Mr. TEAGUE. As of the place where they are attending college?

Mr. ECKLER. Yes. That, we have found by experience, gives us a more nearly complete count of college students. We did, prior to 1950, try to get them as of the homes where they came from, and we found that in a considerable number of cases they were not mentioned by the parents. They forgot to mention that a son or daughter was away at school, so we would get an undercount.

We believe we get a more nearly complete count by getting them at the college.

A further reason for the change is that in terms of our concept of usual residence they are more nearly a resident of the town where they are attending college than they are of the former place.

Whatever there is in the way of demand for goods, demand for police service, facilities, and so on, is more likely to be exerted in the college town. They are there 9 months. They may go back to their homes for the other 3 months, but very often not; they may go elsewhere to work.

Very often it seems we get better information, and better for the users of it, to enumerate them as of the college location.

Mr. FULTON. That brings up the question on the correlation of these figures for the determination of the numbers in congressional districts for redistricting purposes.

Mr. HALL. If the gentleman would yield, I just got a note on that, and I wanted to ask how I could discuss that with the Department.

Mr. ECKLER. The redistricting?

Mr. HALL. No; how you actually go about counting the people Mr. Fulton is talking about, the college students, who gets credit for them, the summer people, the tourists, or people living in mobile homes who are there for weeks rather than days, and that sort of thing.

Mr. FULTON. For example, in the city of Pittsburgh we have a county that has 1,700,000 people in it. The city of Pittsburgh has about 800,000 of that 1.7 or 1.8 million people. There are 4 large schools, universities, and colleges which are located in 1 congressional district of that 1,700,000 people. Now, the question is, Where is the smallest congressional district? Mine happens to have 460,000 people in it in the southern part of the county. Do those people get

credited to the small district, which is our 28th Congressional District of Pennsylvania, or are the people going to college in any one of those four large schools credited among the other three districts, congressional districts, in Allegheny County?

Mr. ECKLER. Mr. Congressman, they would be credited to the district in which the college is located, or the university.

Now, in a great many cases the place might be the same. There would be people who lived in that district and go to the local college, but if they come from another place in Pennsylvania or if they come from outside Pennsylvania, they are counted as residents of the district in which the university is located.

Mr. FULTON. You see, what happens is, from the southern part of the county it is about 20 or 30 miles; it takes you an hour or an hour and a half to go back and forth. So they go out to the fraternity houses, the rooming houses, and live near the college. They actually are home every weekend; they are home all summer, and they really feel they live down in one of our suburbs. But a rather peculiar thing about it, as between the county and the city, differences of opinion often arise on the division between the two, the county and the city. You would get a lot more people living in the city than really live there, and of course as between congressional districts it takes one of the smallest ones with very few homes in it, the first 16 wards of the city, and turns it into a much larger congressional district than actually is the case.

Mr. ECKLER. Because the university is in that location?

Mr. FULTON. Because five large schools are right in that particular center of town.

Mr. ECKLER. That is right, that would increase the population of that area.

Mr. FULTON. For example, the University of Pittsburgh would have, what, 15,000 or 18,000 students. Carnegie Tech and Duquesne University and——

Mr. ECKLER. But I was going to point out, Mr. Congressman, in terms of activity during the week, I assume the great majority of these people probably stay there through the week, but there are some that live in the southern part of the county that spend weekends with their families.

Mr. FULTON. May I finish on one thing?

Are we at the point where we should not have 10 year censuses, but rather should have a continuing census? Would it not be better to try to set a system up that is just continuously in operation, bringing up-to-date figures rather than to plan this thing every 10 years and then try to do it all at one time, when it takes you maybe a year to 18 months to 2 years to come up with accurate figures and they are already out of date?

Now, is the change annually small enough that you could handle more easily the statistical correlations than to try to go through this whole thing every 10 years?

Mr. ECKLER. Well, Mr. Congressman, I am glad to answer that, or try to.

First, I have neglected thus far to point out that we expect to speed up our reports a great deal this time, so that instead of taking 2 years or more, we expect to get a great many of them out a year to

a year and a half sooner, but even so, you are correct, that this is an expensive and time-consuming operation.

Now, there are some countries which have a population register, some European countries which maintain a continuous register. I believe personally that those are rather expensive devices and also that it might be rather unpalatable to our people to be cataloged to that extent and to have a record made of changes as is necessary.

It certainly does give you more nearly current information. It does have a real merit from that point of view.

Mr. FULTON. I am surprised you didn't ask for blood type, to give information to local hospitals.

Mr. MOELLER. Cancer, and things of that type.

Mr. ECKLER. It was suggested, and I think that it is not by any means a frivolous suggestion. The chief point is I think that so many people don't know it, and the housewife reporting for the family wouldn't know it.

Mr. TEAGUE. Dr. Eckler, the committee appreciates your appearance here this morning. We thank you for coming.

We have one other witness who will take a short time, and we will try to finish this morning, although the House is in session.

Our next witness is Mr. James C. O'Brien, who is the Director of Personnel, U.S. Department of Health, Education, and Welfare.

Mr. O'Brien.

Mr. HALL. Mr. Chairman, may I be excused?

Mr. TEAGUE. Mr. Hall, certainly.

STATEMENT OF JAMES C. O'BRIEN, DIRECTOR OF PERSONNEL, U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Mr. O'BRIEN. Mr. Chairman, I realize the limitations on the time of the committee, so I will undertake to be very brief.

Mr. TEAGUE. Thank you, sir.

You do not have a prepared statement?

Mr. O'BRIEN. I do have a prepared statement, Mr. Chairman, which I have given to counsel. Perhaps the best thing I can do would be simply to paraphrase it and submit myself to such questions as the committee might feel to be in order.

Mr. TEAGUE. Thank you.

Mr. O'BRIEN. First, by way of identification, my name is James C. O'Brien. I am Director of Personnel of the Department of Health, Education, and Welfare.

I come originally from the State of Maine. I was educated in the law. I have been a career civil servant for going on 30 years, during all of which time I have been in the personnel and the manpower fields.

I am not a scientist nor do I regard myself as an expert in the field of scientific manpower. However, I have had some experience in that field. In World War II I was responsible with Dr. Carmichael for establishing the National Roster of Scientific Personnel which at that time was a rather gargantuan effort. Subsequently, I was Chief of the Manpower Division of the National Security Resources Board, in which position, Mr. Chairman, I was succeeded by John Hilliard. In 1950, with the outbreak of the Korean threat, I was asked again to

take over this problem of identifying scientific manpower. Since the end of that conflict I have been Director of Personnel with HEW.

Mr. TEAGUE. Where is John Hilliard now?

Mr. O'BRIEN. My understanding is he has gone with one of the large foundations, possibly back to India on a special trip. I am not sure of that, though, sir.

I appreciate the opportunity of appearing here this morning, and it seems the most useful role that I could play would be very briefly to speak of this effort that we had in World War II, what we had to do in the Korean emergency, and then—I am appearing as a citizen rather than as a representative of my agency—to give you one or two judgments which I feel might be useful to the committee as it addresses itself to the particular bill which counsel sent to me.

Actually, in 1940 we had no index in America whatsoever that was of any value with respect to the number of scientists and specialists that there were in our population. Guesses were made. They were as much as 100 percent wrong in some cases. But with the war clouds seriously hovering over the horizon, the President, on recommendations made to him, felt something ought to be done to inventory what we had in this country by way of scientists.

Out of that came the creation of an organization which was known as the National Roster of Scientific and Specialized Personnel.

At that time I was an official of the Civil Service Commission. Dr. Leonard Carmichael was the president of Tufts College in Massachusetts. The two of us were assigned the job of doing something in this area.

As far as I could find out, it was an unexplored area in terms of technique, and so on, and we called on and secured the cooperation of literally hundreds of scientists in this country. We had to take the great tree of knowledge and break down into its component parts so that you could catalog these people.

We put all this on electric punchcard machines and then, as we got closer to a shooting war, it became all the more important that these people be assigned that place in the war effort where they could best serve, whether it should be in uniform or in research projects, in the Manhattan District project or whatever.

We also had a close relationship with General Hershey in the Selective Service System, so we could secure the best utilization of these people in scientific circles.

To make a long story short, it was a successful enterprise, I believe, in the judgment of those who examined it historically. It was a large enterprise. We registered over a million people and something over 50,000 of those people were, one way or another, placed in war-type occupations. This, however, represented not the work of any two people, Dr. Carmichael or me, but the real effort was brought to bear by American scientists.

I think one of the phenomena we are all familiar with in this country is that whenever the Nation gets in real trouble, there is a tremendous turning to and helping out. Ultimately it has been to our successful waging of war, and that is what happened in this scientific roster.

But one of the things that came out of this experience for the first time, as far as I know, was taking the whole complex body

of human knowledge and cataloging it. It was, and is, a complex proposition. We start with mathematics and that merges into physics, and sooner or later biology, chemistry, medicine and so on. To break it down in such a way that it is a sensible classification was perhaps one of the important contributions that came out of this.

Another experience that we had was trying to evaluate the people who were registered. You may find folks whose highest skill may be in one field and someone else's second skill may be something else, but the man with the secondary skill may be a much more important person than the one with the primary skill.

This might illustrate my point:

I remember receiving a questionnaire we sent out to Dr. Albert Einstein. In his own handwriting he said:

> Perhaps I can be of some use in the war, because I used to examine patents in the Switzerland Patent Office.

Then he said:

> As a secondary skill, I have also had some experience in the field of mathematics.

Here is a man whose name is being written in history with Newton and Galileo. Yet we might have a young man who graduated from college less than a year with a Ph. D. in mathematics whose first skill would be math. That was one of the complications of this operation.

Mr. FULTON. It what place did you use Einstein?

Mr. O'BRIEN. He was subsequently used, Mr. Congressman, in the development of the atom bomb, among other things.

Byproducts of this kind of registration were many. One was an ability to forecast supply and demand. Scientists aren't created overnight. It takes a long time to train them. Once you know what the supply is, you can equate against that what the demand is likely to be. Of course in a war situation it is limitless, and so the educational institutions derived some profit from this undertaking.

We also addressed ourselves to the very vital question of whether or not, even with the gun shooting, there should be a mandatory registration. We established a committee, a very high level committee, which was chaired, as I recall, by Mr. Owen D. Young. It was decided even at that time that you wouldn't get the best results by having a mandatory registration of the scientific population.

I mention that because, in my testimony, I suggest that if this new bill contemplates mandatory registration, its opportunity for success would probably not be very great.

When the war ended, the scientific roster was discontinued.

Then in 1950 war clouds were gathering again in the Korean situation, so the operation was resuscitated, if I may use that word. I went to the Office of Education—I was asked to do so—to reestablish a scientific register. At that time we called it the National Scientific Register. In the meantime the Congress was considering this question and establishing a National Science Foundation which, of course, has since been established.

One of the sections of the bill creating the National Science Foundation called for the creation and maintenance of a scientific roster in the National Science Foundation; that register is now maintained. I am not prepared to testify here today as to its dimensions. I be-

lieve that later witnesses will speak to that point. But from this beginning experience in 1940, there has been a reasonable continuity of consideration of the question.

Now then, Mr. Chairman, I think that I could summarize what I think is most important for me to say here today, in just about 1 minute. That is that I think the objectives of the bill, which counsel sent to me, which is to be introduced, calling for a committee or a group to study this whole problem of scientific manpower, is a tremendously important one.

One of the needs that I see—and again I don't address myself to this as a specialist but just as one who has had some experience—I see the need for a uniform system of nomenclature, a system of terminology. These new scientific advances are happening every year, and last year's terminology is just like last year's model of an automobile, it is inadequate. Thus as the Federal Government addresses itself to counting the noses and the brains behind those noses in terms of our scientific population, we all ought to be talking the same language because if one educational group calls a neurophysiologist one thing and the Science Foundation calls him another, and the Bureau of Labor Statistics another, we are not getting an accurate count. If one of the byproducts of the proposal would be to get a standard system of terminology, I think that would be a tremendous step forward.

I think also that the total strength of our Nation with respect to science rests in the human resource, in the brains of our scientific and specialized people. That resource is so important that the Federal Government should know its dimension, should know its dimension and the characteristics of that great resource, because the laboratories, the planning of research, everything, depends on what you have to work with in terms of scientific personnel.

I perceive, in the draft of the bill to which I am testifying today, an effort to get a high-level look at this problem of scientific personnel. I commend that effort. I think it is terribly important, and I am delighted to have the chance, Mr. Chairman, to come here today and to offer my testimony in support of it.

(The bill referred to is as follows:)

[H.R. , 86th Cong., 1st sess.]

A Bill To provide for an immediate study of the need for, the proper composition of, and the most efficient means of obtaining a continuous up-to-date national record of scientific and technical personnel throughout the United States.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled. That there is hereby established within the executive branch of the Government an independent interdepartmental Committee on Scientific and Technical Personnel (hereinafter referred to as the "Committee"), to be composed of a Chairman selected by the President from the Federal Council for Science and Technology and one member (to be selected by the head of his respective agency) from each of the following: The National Science Foundation, the Bureau of the Census, the Civil Service Commission, the Department of Defense, the Department of Labor, the Department of Health, Education, and Welfare, the National Aeronautics and Space Administration, and the Central Intelligence Agency.

SEC. 2. (a) It shall be the duty of the Committee—

(1) to make an intensive study of the need, both governmental and nongovernmental, for a permanent, comprehensive, and continually current

record of scientific and technical personnel throughout the United States which will provide appropriate information on both the formal training of such personnel and their subsequent experience;

(2) to determine the type and kind of information which such a record could most advantageously supply and should be expected to provide;

(3) to determine in what manner and through what means such a record may best be maintained; and

(4) to report its findings and recommendations to the Congress not later than two hundred and seventy calendar days from the date of the enactment of this Act.

(b) the findings and recommendations referred to in paragraph (4) of the preceding subsection shall include (but not necessarily be limited to) the following:

(1) The probable cost of any recommended program.

(2) The estimated length of time which would be required to place an effective scientific manpower tabulation program in operation.

(3) Whether the best results could be expected through compulsory or voluntary means.

(4) What agency of Government should bear responsibility for the program, and whether that responsibility for the program, and whether that responsibility should be exclusive or merely primary.

(5) What agencies of Government should be expected to cooperate with the agency responsible for the program and the manner in which such cooperation should be carried out.

(6) What amendments, if any, to laws now affecting scientific manpower tabulations or registers should be made.

SEC. 3. In carrying out the functions specified in section 2, the Committee is authorized and directed to consult with the Federal Council for Science and Technology, and to obtain the views of such private individuals and organizations as the Committee deems appropriate as well as those of Government agencies not represented on the Committee but having specific inerest in the program under study.

SEC. 4. For the purpose of effectuating this Act, each agency represented on the Committee shall furnish, upon the request of the Chairman, necessary assistance to the Committee as authorized by section 214 of the Act of May 3, 1945 (59 Stat. 134; 31 U.S.C. 691). Such assistance may include the detailing of employees to the Committee to perform functions consistent with the purposes of this Act.

SEC. 5. Upon the completion of its study and the submission of its report to the Congress as provided in section 2(a)(4), the Committee shall cease to exist.

Now, I will be glad to answer any questions.

I am trying to be brief. There is much more I could say here.

Mr. TEAGUE. The bells have rung, Mr. O'Brien, which means we have to go to the floor.

Mr. FULTON. May I say one thing?

Mr. TEAGUE. Mr. Fulton.

Mr. FULTON. On your statement, page 2, "which proved to be as much as 100 percent in error," I don't think you mean that, because that leaves no percentage of being correct. They may have been a group, each of which was wrong, but each one in that group was certainly not 100 percent wrong.

Mr. O'BRIEN. I accept your correction, Mr. Congressman. It isn't stated properly. Let me say, in amendment of this statement, that there were very poor guesses made in lots of situations.

Mr. FULTON. A large amount of error.

Mr. O'BRIEN. Yes.

Mr. Chairman, I appreciate very much the opportunity of coming here today.

Mr. TEAGUE. Thank you, Mr. O'Brien.

(Whereupon, at 11:22 a.m., the committee adjourned.)

(Mr. O'Brien's prepared statement follows:)

TESTIMONY OF JAMES C. O'BRIEN, DIRECTOR OF PERSONNEL, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Mr. Chairman, and gentlemen of the committee, my name is James C. O'Brien. I am on temporary assignment until next week as Executive Secretary of the Career Executive Board and my regular position is that of Director of Personnel of the U.S. Department of Health, Education, and Welfare. I come from the State of Maine. My basic education was in law, and I have been a career civil servant for more than 29 years, during all of which time I have been in the personnel and manpower fields.

I appreciate the privilege of appearing before this committee and being allowed to give my testimony on the questions enumerated in the committee's letter of invitation to appear. I am not a scientist nor am I an expert in the scientific manpower field. I believe that the committee's invitation was based upon the fact that during World War II I served as Executive Officer of the National Roster of Scientific and Specialized Personnel. This agency was established by the President in 1940 and charged with developing complete information concerning the names, locations, and special skills of the scientific and professional manpower pool of the Nation and with establishing means for its fullest wartime utilization.

Again in 1950, I was Director of the National Scientific Register which again represented a method of inventorying America's scientific population. This register was established under my direction in the U.S. Office of Education as a part of national preparedness in connection with the Korean emergency. In 1951, the National Scientific Register was taken over by the National Science Foundation and is still maintained by that organization. It is against this backdrop of experience that I appear here this morning.

Reverting for the moment to the World War II National Roster, I may say that when the Nation was entering the emergency period preceding World War II, there was no single or adequate source of information available showing the names, locations, or skills of the country's scientists, engineers, and technological personnel. Informed sources made personnel estimates in certain engineering and technological fields which proved to be as much as 100 percent in error. Because of this alarming lack of knowledge of skills of the highly needed specialists in various fields, the President, in the spring of 1940, directed that immediate steps be taken to develop an inventory of the scientifically and professionally trained individuals of the country, and to establish a systematic method of channeling such individuals into the war effort.

The recommendation to the President to establish the National Roster represented foresight on the part of those responsible for manpower planning in those prewar days, including particularly Dr. Thomas C. Blaisdell, Jr., who was then Assistant Director of the National Resources Planning Board, and Dr. Arthur S. Flemming, now Secretary of Health, Education, and Welfare, who was at that time Civil Service Commissioner. In June 1940, Dr. Leonard Carmichael, then president of Tufts College and now Secretary of the Smithsonian Institution, was appointed director of the project, and I was made its Executive Officer. Dr. Carmichael and I were immediately faced with the need to develop for the first time in American history a comprehensive system for classifying scientific occupations. This involved breaking down into interrelated classifications the whole tree of scientific and technological knowledge and providing a ready method of slotting into proper classification compartments the skills and combinations of skills represented by the American scientific population. In this particular process of developing a scientific classification system, literally hundreds of the Nation's foremost scientists gave of their time and knowledge and it was only through this contribution by the scientific community itself we were able to do such a complicated job quickly and effectively. As a rapid mechanical means of codfying and sorting these hundreds of thousands of individual skills, the information was placed on an electric card punch system, and thus a combination of any skills could be almost instantaneously produced to meet any demand.

As the war developed, the National Roster was constantly called upon to assist the military services, industries, and research laboratories in locating highly skilled personnel in the many scientific and professional fields. In addition, the office became the central source of information concerning shortages in specific professional fields which required special methods of conservation or acceler-

ated training. The National Roster also developed information concerning occupational relationships which, for example, resulted in the successful utilization of certain types of biologists in radar research.

As the war effort became more complete, the National Roster worked closely with the Selective Service System in establishing deferment policies in scientific and professional areas which had for their end result the retention in civilian status of highly skilled individuals who would otherwise have been eligible for military duty, but whose work as civilians was more important to the Nation.

Throughout the planning of the organization of the National Roster, three basic ideas were emphasized: First, the conseravtion and most effective use of the skills of America's specially trained scientists; second, the proper evaluation of needs and supplies of manpower in the fields covered by the Roster; and third, an effort to increase the efficiency of placement in specialized fields.

The experience of the National Roster during the last war clearly demonstrated that a thorough and analytical knowledge of the highly trained manpower of the Nation makes it possible in literally tens of thousands of cases to plan effectively for the efficient staffing of new war enterprises. World War II also proved that there are other valuable byproducts to a central register. Among them were procedures for notifying the armed services when specially skilled individuals were induced so that they could be assigned to military duties consistent with such skills; the maintenance of relationships with the country's institutions of higher education to furnish advice on accelerated training in special areas where shortages were developing; the preparation and distribution of occupational materials widely used in vocational guidance and counseling activities throughout the Nation; and the conduct of studies of college registration to secure bases for projection of information concerning predictable shortages and surpluses in specific fields. These and similar services were available on the basis of the central registration.

The skills of more than a million American specialists, scientists, and other technologists were ultimately registered in the national roster and it has been estimated that more than 50,000 individual specialists were transferred into the war effort, either in or out of uniform, as a result of the roster's activities. The basic pattern of classifying scientific skills which was thus developed 19 years ago has in general terms withstood the test of time up until the present. But this relates to the general framework rather than the specifics. However, and this is very important, major changes in scientific classifications have become necessary through the tremendous and varied advances which have been made on many scientific fronts in the last two decades. New fields have emerged and new techniques in research areas have been developed. If the body of scientific knowledge is to be adequately classified, and there are numerous reasons why it should be, then some organization should have central authority and means for constantly analyzing scientific activities and identifying in standard terminology occupational categories which are constantly emerging.

In 1950 when the Nation was again confronted with an emergency situation, the World War II National Roster was reactivated as the National Scientific Register. At that time, many of the World War II scientific classifications were brought up to date again with the assistance of a number of scientists and representatives of scientific societies, and the scientific classifications were kept current for the period of the Korean emergency. In December 1952, the Scientific Register was transferred to the National Science Foundation.

Based on my experience with the World War II National Scientific Roster, as a naval officer responsible for establishing and administering a system of identifying the skills of naval officer personnel, and as the Director of the National Scientific Register, it is my judgment that it is important to the country that there be maintained on a continuing basis some adequate system for identifying with reasonable precision information concerning the characteristics of America's scientific manpower pool. It is obvious that the strength of our Nation in the field of science is ultimately represented by its scientific manpower. Financial grants and research institutions are meaningless without capable and well-trained scientists to apply their skills, talents, and imaginations to the research problems at hand. Adequate knowledge of the size and location of the national scientific manpower pool is essential to research planning, to the development of higher education curriculums, and to an assessment of national strengths on all scientific fronts.

It is my understanding that one of the purposes of the bill now under consideration by the committee is to determine what action is necessary to have a permanent, comprehensive, and continually current record of scientific and technical personnel throughout the United States. In my judgment, this is a tremendously worthwhile objective, and I am happy to have an opportunity to add my testimony in favor of such an undertaking.

I might further recommend to this committee that if such a special study commission is established, it should be asked to consider the need for developing standard nomenclature for classifying scientific skills and scientific information. Standardization of terminology in the field of science is of utmost importance because it ultimately provides a point of departure for varieties of other studies such as supply and demand surveys, dissemination of scientific information, recordation of special scientific skills and development of educational and training curriculums.

The whole question of a coordinated scientific manpower program at an appropriately high level in the Federal Government is in my judgment a vital part of any overall program designed to maintain our national strength in the field of science. The study commission which would be created by the proposed bill would undoubtedly concern itself with finding an appropriate point of leadership and coordination in the executive branch giving such an organization status and funds it would need to carry on an effective program. It would also serve to focus attention on an important manpower area and to make sure that it received as much attention as it deserves. It is my judgment that the objectives of the proposed bill to have careful study given to the scientific manpower problem are highly worthwhile.

I appreciate very much this opportunity to express these points of view to the committee.

SCIENTIFIC MANPOWER AND EDUCATION

Part II—Census on Scientific and Technical Personnel

THURSDAY, JUNE 25, 1959

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C.

The committee met at 10 a.m., Hon. Overton Brooks (chairman) presiding.

The CHAIRMAN. This morning we have two witnesses. Dr. Dael Wolfle is the executive officer at the American Association for the Advancement of Science, the large national membership society that represents all fields of science. He received the bachelor of science and master of arts degrees from the University of Washington, in Seattle, and the doctor of philosophy degree from the Ohio State University, in 1931.

Prior to World War II he served as professor of psychology at the University of Mississippi, and as examiner in the biological sciences and assistant professor of psychology at the University of Chicago. During World War II, he was Civilian Training Administrator with the Army Signal Corps and a technical aid in the Office of Scientific Research and Development.

From 1950 to 1954 he was Director of the Commission on Human Resources and Advanced Training. This commission was established by the National Academy of Sciences and the research councils in education, social sciences, and the humanities to study the Nation's resources, potential resources, and supply of persons in science, engineering, and the other professions. It made extensive use of data from the Bureau of the Census, the Bureau of Labor Statistics, and the national rosters, and conducted its own special studies of specialized manpower supply and demand.

He is a member of the Defense Science Board of the Department of Defense, a former member of the Scientific Advisory Board of the Air Force, and has served or is now serving as a consultant to the Office of Naval Research, the Civil Service Commission, the National Science Foundation, and other Federal agencies.

Doctor, we are very happy to have you here this morning.

You have a prepared statement, and we would appreciate your proceeding with it.

STATEMENT OF DAEL WOLFLE, EXECUTIVE OFFICER, AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Dr. WOLFLE. Mr. Brooks, members of the committee.

A national roster of scientific and technical personnel can be established for any one, or any combination, of three reasons. Let me first state these reasons. I will give my judgment of their importance in a few minutes.

One reason is to provide information useful as an employment service. Access to this information, and use of the roster for employment purposes, might be limited to agencies of the Federal Government, or might be open to other prospective employers.

A second use also deals with employment, but is, in fact, an insurance policy for the future rather than an employment service for the present. It is an insurance policy against the day when we may suddenly need to mobilize our scientific and technical resources in a great hurry.

The third use is to provide statistical information concerning the numbers of persons qualified for or engaged in scientific or technical work, and the distribution of such persons with respect to age, education, geographical location, technical specialties, field of employment, and other characteristics.

The relative importance of these three uses may change from time to time. In the years immediately following World War II, I was chairman of the little group within the Research and Development Board of the Department of Defense that was responsible for providing guidance to the military services concerning scientific and technical manpower information. At that time the insurance policy function seemed important, and my colleagues and I encouraged the Office of Naval Research, and later other agencies, to establish rosters in such a way as to make the information widely and quickly available for possible mobilization use.

In 1951, when the National Science Foundation became ready to assume responsibility for the National Roster of Scientific and Technical Personnel, I was asked to prepare a policy paper that would help the NSF to establish its own guidelines for the roster it was required by law to develop. I advised, and I would still advise, that the immediate employment function be given very little weight. There are three serious difficulties with the use of a national roster for employment purposes. One is that many of the men and women whose personal data would be on file are well satisfied with their present positions and do not wish to move. The second is that many employers object strongly to having the names and qualifications of their employees included on a roster that could be used for raiding purposes. These two difficulties guarantee that the roster will be incomplete. Some scientists and engineers will prefer not, or will not be permitted, to file their records.

The third difficulty is that the Federal Government cannot work as effectively in the employment referral field as can the specialized societies, such as the American Chemical Society or the American Society of Electrical Engineers. These societies are closer to their own members and their fields of work, and they understand better both the qualifications and the job requirements than can a Federal

agency that would have to deal with all fields of science and engineering.

The other two uses of a roster—its insurance function and its use for statistical information on scientific and technical manpower trends—seemed important in 1951 and were, in fact, the primary bases upon which the NSF roster was established.

Last year, in 1958, officers of the National Science Foundation were dissatisfied with the way things were going, and asked me to serve as chairman of a panel of advisers that would give a critical review to the operations of the NSF roster. With respect to basic functions, employment service use still merits only low priority. (See Wolfle report, appendix p. 765.)

The insurance policy function now presents a puzzle. Historically this has been an important justification of national rosters. But, times and conditions of warfare have changed in the last dozen years, and it seems less likely now than it did earlier that we will have the need or the time to mobilize our entire scientific and technical personnel. If I were establishing a roster now, I would want the most thoughtful advice I could secure from the agencies responsible for military and civilian mobilization and defense to learn just how, under varying circumstances, they think that they might make use of information in the roster files. It may, for example, appear to be more useful to have a considerable amount of information concerning a relatively small number of persons in highly critical fields than it would be to have a general scientific and technical roster.

If the study called for in this proposed bill is carried out, I would hope that a good deal of attention would be paid to the ways in which the information might be used by military and civilian defense agencies under varying conditions of mobilization requirements.

The third function of rosters, their use in providing statistical information, seems to grow more and more important year by year. Information on numbers and characteristics of scientists and engineers is highly useful to several agencies of government and to the scientific and engineering groups themselves.

The reason that I have given so much emphasis to the several possible uses of a roster is that I am strongly of the opinion that no roster should be established unless there is clear agreement in advance on the uses to which the information will be put and on the arrangements for collecting and maintaining the information in maximally useful form.

There are two other conclusions I would like to state. One is that it is largely a waste of time to establish a national roster unless there is agreement on the procedures which will make it possible to keep the names, addresses, and personnel information up to date. One of the failings of past rosters is that more effort has gone into getting the original information than has gone into keeping that information up to date. By working with the scientific societies in the several fields, it is possible to keep information reasonably up to date for those persons who are members of the societies, for the societies must maintain up-to-date address lists. There is no such easy method of keeping information up to date for persons who are not members of the appropriate scientific and engineering societies.

The other conclusion I would like to stress is that any national roster now being contemplated should be so established as to constitute an integral part of a larger program for securing national information on scientific and technical personnel and the probable supply and demand trends for such personnel. About 2 years ago the President's Committee on Scientists and Engineers came to the conclusion that the Nation needed better basic statistical data concerning scientists and engineers. At about the same time, the Bureau of the Budget asked the National Science Foundation "to develop a program for collection of needed supply, demand, employment, and compensation data with respect to scientists and engineers, and for such other professional groups as it considered appropriate." By agreement among the President's Committee on Scientists and Engineers, the National Science Foundation, and the Bureau of the Budget, these separate interests were merged into a single study. A committee of persons well acquainted with scientific and engineering manpower trends and statistics were appointed, and in 1958 submitted a report entitled "A Program for National Information on Scientific and Technical Personnel." The National Science Foundation published this report and circulated it for comment to interested Government agencies. (See appendix p. 767.)

This is not the time to press for adoption of the specific recommendations made by the advisory committee, but I would like to urge that a national roster be considered not by itself alone, but as part of, and potentially a very important part of, an integrated program for the development of information on the Nation's scientific and technical personnel resources.

From what I have said before, it should be clear that I am firmly convinced that careful study and planning on the part of a number of Government agencies is essential to the continued effectiveness of a national roster. I am, therefore, heartily in accord with the idea of studying the uses which might be made of roster information and the methods of keeping that information up to date and maximally effective. I am not sure that new legislation is necessary to initiate such a study, but I am delighted to know that the Committee on Science and Astronautics is showing this active interest in the subject of rosters. If maintained ineffectively, such rosters are a waste of time and money, while if maintained effectively, they can be a very useful source of information—not only about individual scientists and engineers, but about manpower trends in science and engineering.

The CHAIRMAN. Doctor, I have listened intently to your statement, and you have your feet on the ground. You have some good ideas in here.

I want to ask you in further reference to your ideas, if we set up a census of scientists and engineers and if we established a roster, I would think that we would have to, by law, specify the use for such a roster.

I can see your idea that there would be objection on the part of industry for supplying the information on names and addresses of their own personnel if the public could use that to shop with and engage in competitive employment practices. I think that has to be guarded against. But don't you think that could be done by rules and regulations and by the law itself?

Dr. WOLFLE. The law certainly might state the use to which the information might be put.

The CHAIRMAN. We don't want any employment piracy going around. So let me ask you this: Should this list be public in any sense of the word or should it be available for use from which statistics might be obtained and conclusions drawn?

Dr. WOLFLE. The statistics will be equally useful, even though the list itself is not public property. If a responsible agency carries out the statistical analyses, they can then present that information, and it ought certainly to be public, even though the names, the ages, the salaries, and so on, of the individuals in the roster aren't public property.

The CHAIRMAN. When this matter was first mentioned to me, my reaction was this: If you have a field where there is a dearth of scientific talent, we could encourage the universities and the schools throughout the country to make up that deficit. If we have a field where there is ample talent available for industrial purposes, there is no need of encouraging our school people to emphasize this type of scientists. Is that not true?

Dr. WOLFLE. This is one use of the statistical kind of information.

The CHAIRMAN. Yes, Mr. Anfuso?

Mr. ANFUSO. My question, Mr. Chairman, has been partially answered, about making these names and all of the data public. I can see why business people would object to any such thing, because it would amount to inviting raiding parties on their personnel.

Do you think perhaps there should be some classification made as to the roster, making the information classified and limited only to Government agencies?

Dr. WOLFLE. This gets back to the use question.

Are you contemplating that the Government might use it for employment purposes?

Mr. ANFUSO. Yes.

Dr. WOLFLE. This does not completely avoid the objection on the part of industry in that——

The CHAIRMAN. May I interrupt?

Would you make it available to Government for use in employment, for employment purposes, or not? What would be your recommendation there?

Dr. WOLFLE. I would be willing to do so.

The CHAIRMAN. All right.

Dr. WOLFLE. But this and several other answers, sir, are compromises. Any employment use is likely to make some people less willing to be included. It makes others much more anxious to be included.

Mr. ANFUSO. Would you also make it available, Doctor, to certain private agencies doing Government work, under the proviso that the *Government and not any individual is making it available?*

Dr. WOLFLE. There is a compromise; there is a way out of this situation. If one operates the national roster in cooperation with the specialized societies in mechanics, in engineering, in chemistry, and so on—and there are advantages to the Government in working with these groups because they have the most up-to-date lists—then the private employment function can be turned over to them. They need not use the entire list, but only those who are willing to have it so used.

I doubt the wisdom of having the Federal Government in the employment business generally for this group.

Mr. ANFUSO. Do you recommend, Doctor, in connection with this bill, that we call upon certain business people who have skilled and scientific personnel to get their views?

Dr. WOLFLE. I would, if I were responsible for the study.

Mr. ANFUSO. That is all, Mr. Chairman.

The CHAIRMAN. Mr. Daddario.

Mr. DADDARIO. Doctor, as I understand you, one of the problems that you feel exists in this field is that you must have a roster with the necessary information kept up to date so that in time of emergency it can be used. And you think this is one of the difficult problems to overcome?

Dr. WOLFLE. If you have any roster at all, you have to keep it up to date. Otherwise, it rapidly gets useless. For the past dozen years or so I have felt, and I have advised on previous occasions, that this mobilization use, what I called insurance policy, was an important justification. I become less certain of that as time goes on. If we were mobilizing for another Korea or another World War II, clearly yes, such a roster would be of advantage. If we don't have time to mobilize, then I am not sure whether this is going to be useful or not.

Mr. DADDARIO. Well, since this is one——

Dr. WOLFLE. This is why I urged careful consideration with the defense agencies of how they would use the information.

Mr. DADDARIO. Well, since one of your justifications for the formation of such a roster is the use of it as insurance, it would seem to me that there has to be some thought given to the particular question of how to use it under emergency situations.

Now, have you given any thought toward including within this roster the possible assignment of certain personnel to certain areas and to certain responsibilities during time of emergency?

Dr. WOLFLE. It might well be used as a basis for this kind of mobilization assignment.

Mr. DADDARIO. Well, in a sense, wouldn't that be the only way you could accomplish it, taking into consideration that if we do run into an emergency, and if an attack does come, that you would almost—well, you would have to automatically get people working the moment the emergency begins.

Dr. WOLFLE. It might be used for mobilization assignment. It might be used as a quick way of getting information about who, with what qualification, is where; for emergency conditions that you don't anticipate, areas of responsibility or kind of work for which mobilization assignments have not been made, but which turn out to be important, here is a quick channel of getting to the people.

Mr. DADDARIO. Thank you, Doctor.

The CHAIRMAN. Doctor, I want to ask you a few questions. We have had experience with the draft now. I sat on a committee that wrote the draft law, and I also sat on a committee that handled the reserve program. Now, with the draft law you do have required registration. You do have secrecy in the files. They are not open to the public, and you do keep them up to date.

Now, I don't think that we need any organization of that sort in order to accomplish what you have in mind here. But we could apply

some of the principles that we learned in handling the draft. I don't mean in reference to the draft but in assembling the information.

Likewise, couldn't we apply principles that we learned in reference to keeping up with our Ready Reserves in the reserve program?

Are you familiar with those two programs?

Dr. WOLFLE. If you place obligations on the people who are included in the roster, as the reserve program and the draft program do have obligations—I have a son who is just registering today with the Selective Service System. He knows that he is going to get into trouble if he doesn't keep the draft board informed of where he is.

The CHAIRMAN. Well, you know a little about it, then?

Dr. WOLFLE. This is not true of the existing rosters.

The CHAIRMAN. Doctor, on the other hand, with the reserve program you didn't have that obligation, and there was great difficulty in keeping it current. Korea came along, they called our Reserves, and much to the amazement of everybody, they sent word to mobilize people who had been dead 2 or 3 years. They mobilized people who had changed their occupations and moved to distant communities. There was all sorts of confusion.

Now, that is what you would want to avoid, isn't it?

Dr. WOLFLE. Yes.

The CHAIRMAN. And unless it is kept up to date, it is not of great help to our people.

But my thought is this: Not so much to use that as an employment means at the present time but to use it for the purpose of balancing the possible future demands of the country in the way of technical scientific work.

Don't you go along with that thought?

Dr. WOLFLE. Using it for that purpose requires the statistical studies, analyses, and publicity for the information. It does not interfere with, and it does not require public access to, the detailed personnel information about each registrant which could be used for mobilization.

The CHAIRMAN. Well, if we use it for that purpose, would we encounter any trouble on the part of industry in getting information?

Dr. WOLFLE. No.

The CHAIRMAN. With that purpose firmly established, don't you feel that we would get cooperation from industry?

Dr. WOLFLE. That purpose I think would elicit cooperation, and that purpose is generally recognized to be a highly useful one.

The CHAIRMAN. Now, we are moving terrifically fast through scientific fields at the present time. Before you pass through one era of scientific development, you are in another era. It is entirely possible—in fact, probable—that the need for a certain type of scientist will develop in the future that we don't have available. So there may be new categories to add to the list.

If we are going to anticipate any of the needs, we have got to know what we have available at the present time. My thought is that when this information is available, you could send it out to the schools of the country and let them know where there is a shortage of certain types or categories of scientists or engineers.

Does that make sense?

Dr. WOLFLE. It makes sense, sir, but it also involves a large number of difficulties. There is real trouble in trying to anticipate what the

demands will be some years hence and what the supply and demand trends are going to lead to.

The CHAIRMAN. In certain areas—for instance, doctors—it is obvious you have a shortage of doctors still. We had the shortage during World War II, and we have had it ever since.

On that sort of thing you wouldn't take much hazard by predicting there.

Dr. WOLFLE. No.

The CHAIRMAN. Now, throughout our country there has been a shortage of engineers, construction engineers, civil engineers. I don't know whether that shortage still exists, but certainly they have had trouble. We have had our people asking for the release of engineers from the Army in order to make them available back home, where there was a real shortage in civilian occupations. You wouldn't encounter much hazard, would you, in predicting there?

Dr. WOLFLE. If you are making this information available to individuals and to schools, you have not only to worry about the problem of 1959 but what will the situation be in 1963 or 1964 or 1965, when the entering freshmen are going to be through and ready to go to work.

The CHAIRMAN. Well, wouldn't you, in 1959, recommend an increased study of science?

Dr. WOLFLE. I would. But I am biased.

The CHAIRMAN. Well, I think the program generally of most of the departments of Government is to recommend an increased study in science. If that is the case, can't we go just a little further and indicate types of scientific work that might be needed?

Dr. WOLFLE. The more precise the information we can get about supply-demand trends and shortages and about the number of people and the characteristics that are desired, the better the advice we can give to colleges and universities and high schools and students. We are advising them all of the time whenever we talk about shortages of engineers or shortages of doctors. The advice we could give if we had the more detailed information that we are talking about would be better than we are able to give now.

The CHAIRMAN. Now, you have a youngster just registering for the draft today. If he came to you and asked your advice regarding a type of work to follow, wouldn't you like to have available to guide him some statistics to show where there is need for employment, and where there is no need?

Dr. WOLFLE. This is one of the things that would be useful.

The CHAIRMAN. And it would help the whole country to fashion its program of education so that we would be making up deficit occupations? That is correct, isn't it?

Dr. WOLFLE. Somehow or other, we have gotten into the situation where I seem to be criticizing rosters. I don't want to be so interpreted. I have worked with and helped to develop some, and I think they are and can be extremely useful tools for the sort of purpose you are describing.

The CHAIRMAN. There certainly is no intention on my part of putting you in the position of criticizing, and I didn't intend that by these questions. I was just trying to elicit the information.

Would you, in establishing rosters or in setting up scientific statistics, work through the scientific organizations such as the American Chemical Society?

Dr. WOLFLE. I would work with them. I would work through them. But I would not decentralize the entire operation to them. They are the best source of information about who now are chemists or electrical engineers, where they are, and what they are doing. Their membership is in most cases not complete, but the membership and the society's opportunities to get in touch with others who aren't members provides the best base for getting the list to start with, and the best method of keeping addresses up to date, barring an obligatory census type or selective service kind of registration.

The CHAIRMAN. Well, you don't recommend an obligatory type of census, do you?

Dr. WOLFLE. I would not.

The CHAIRMAN. Can't you accomplish a fairly complete census by voluntary means?

Dr. WOLFLE. You can, and its completeness will be greater for those people who are well trained, good, professionally employed, and so on. Its completeness will trail off as you get to the margins.

The CHAIRMAN. And if we let them know the reasons we have in mind for a census of scientists, we could expect from them reasonable cooperation, couldn't we?

Dr. WOLFLE. They are cooperating now with the National Science Foundation. This is essentially the way the NSF roster has been established.

The CHAIRMAN. However, there is indication that it is not complete. There is indication, as I recall the testimony, that they had let it drop for a while.

Dr. WOLFLE. It is part out of date. It is not complete. It does not include the large engineering groups.

The CHAIRMAN. How would you approach the large engineering groups?

Dr. WOLFLE. In the same way. They are also organized into individual professional groups, in chemical, mechanical, electrical engineering.

The CHAIRMAN. What size problem is this?

Dr. WOLFLE. It is a large problem, because the number of engineers is very large, 700,000 or 800,000, and the coverage of the societies is less complete than it is in the pure sciences. This is partly the result of the fact that the term "engineer" is sometimes conferred by university degree and sometimes conferred by personal vanity, so that the engineers that we have in census enumeration vary greatly in duty, in responsibility, in ability, in educational background, and not all of them are in the professional societies.

The CHAIRMAN. I think we have covered the matter of the use there, and you gave your opinion.

Mr. Hall, do you have any questions at this time?

Mr. HALL. Yes, sir.

It has to do with a list or compilation of the facilities in the country.

You talk about personnel here. Do we have any comparable roster for scientific facilities that is available to this various scientific personnel?

Dr. WOLFLE. I am sorry, I can't answer that question on an up-to-date basis.

There have at some times been such lists compiled. Whether there is at the present time any up-to-date one, I don't know.

Mr. HALL. When we make an appropriation——

Dr. WOLFLE. May I ask Dr. Armsby on this?

STATEMENT OF HENRY ARMSBY, U.S. OFFICER OF EDUCATION

Dr. ARMSBY. We have a study which covers a good part of the facilities of the Nation. It doesn't cover everything.

The American Society of Engineering Education has recently made a study too. They are part of the picture.

Mr. HALL. To what extent is that used by the scientific community whenever it is made toward the development of a new project? The first thing we hear is always money to build a new installation with. I am wondering if it would be possible through such a list or inventory to route these various projects into areas where the facilities are already available.

Dr. ARMSBY. It should be possible to do that, yes. The information is available in this area, such as it is. It is not complete.

Mr. HALL. Very incomplete?

Dr. ARMSBY. Yes.

Dr. WOLFLE. Frequently the requirement is for something new that nobody has had before.

Dr. GAMBLE. I think Mr. Mills, of the National Science Foundation, might comment on that, the facilities inventory, in work that the National Science Foundation does.

Mr. HALL. If you would.

STATEMENT OF THOMAS MILLS, NATIONAL SCIENCE FOUNDATION

Mr. MILLS. I can answer very generally on that.

There is a Directory of Industrial Research Laboratories. This covers industrial facilities, which is covered by the National Research Council.

Now, in addition to that, the National Science Foundation's studies cover the expenditures for research and development by various segments of the economy. This gives you an indication of where you will find facilities but not the specific kinds of facilities which you may want to know about.

Mr. HALL. Is there any present method of cataloging what instrumentalities are available in any one of these installations, such as computers or reactors?

Of course we would know reactors from the Atomic Energy Commission, but that is an illustration, something that would not be as controlled as a reactor, of which there would not be so few.

Mr. MILLS. I don't think you would find anything complete on that. I think you would find some pieces, for example, some of the Federal agencies support the computer program, and they of course would have information on where they are supporting programs.

Mr. HALL. Well, now, the Foundation does that?

Mr. MILLS. Yes; some programs, but I think there would not be anything like a complete analysis of any of these.

Mr. HALL. What about the facilities of the various universities and colleges in the country, do we have an inventory on that?

Mr. MILLS. Well, sir, when you say "facilities", I think the Foundation would know what laboratories there were. But what kind of equipment there is in those laboratories is not put together in a comprehensive way.

Mr. HALL. With respect to the personnel roster, I gather it is your opinion that with some additional work in the area that the manner in which it is presently being handled, on a limited basis, is the manner in which it should continue to be handled?

Dr. WOLFLE. I said once before I was biased, and perhaps I still am here.

In general, the National Science Foundation roster is working along the lines which I helped to establish. I thought they were the proper ones, and I still do, yes.

Mr. HALL. Maybe I misunderstood part of your statement, that some of the recommendations that were made by you and by others on one of these groups, study groups, were either not satisfactory to the group or to the group to which they were made.

Did you make that statement?

Dr. WOLFLE. Yes, I made that statement.

The difficulty is that the operations had not been kept in step with the concept or plans so that records were getting out of date and were not being maintained in a fashion to be usable.

Mr. HALL. I see. So that there has been a defect in the administration of the records of the program; that is what it is, in effect?

Dr. WOLFLE. Yes.

Mr. HALL. That is all, Mr. Chairman.

The CHAIRMAN. Mr. Wolf.

Mr. WOLF. I certainly think it is a good thing for the committee to have you here, and I am glad that you came.

Those of us who first talked about this some time ago were thinking in terms of a real census based on the needs for this information in times of a crash program, in case a great national emergency would arise. So we are naturally interested in getting anybody we can before the committee who has interest in the matter.

I notice you suggested "If I were establishing a roster now, I would want the most thoughtful advice I could secure from the agencies responsible for military and civilian mobilization," and I was just wondering if you had any people in mind that you would like to suggest specifically that we ought to have here before we finally make the decision on this bill.

Dr. WOLFLE. I was thinking not so much of hearings, sir, as the detailed study being contemplated in the hearing. Probably part of the information that I am asking for is highly classified. But what are our defense plans? What are our mobilization plans under various sorts of contingencies, and in these situations what use could be made or would be likely to be made by the Department of Defense and by the Office of Civil and Defense Mobilization?

Mr. WOLF. Are there any people on the outside——

Dr. WOLFLE. Would they use this information if we build up a roster as an insurance policy, or would they not?

Mr. WOLF. Do you have any people in mind on the outside not connected with the Government in any way who might be helpful to

us in getting more ideas into this study, any college studies that might be going on at the present time, or any private industry work?

Dr. WOLFLE. There are several other related activities. There are a few commercial ventures in which there is an effort to get together information for employment purposes.

The editor of the volumes, "American Men of Science", which is a biographical directory that comes out at intervals of every 3, 4, or 5 years, is currently contemplating putting that information on one of the electronic memory devices so that he will have a substantial and privately managed roster that might be used for employment service.

I have told him I have some doubts about this, but there are some outside ventures of this sort, and if you would like to have them, I am sure we can supply you names of the people who are involved.

Mr. WOLF. With the chairman's permission, I am sure that we would be very happy to have that information.

The second thing I underlined here is many employers object strongly to having the names and qualifications of their employees included on a roster that could be used for raiding purposes.

I am sure we all agree with this.

Then you go on to say these two difficulties guarantee that the roster will be incomplete.

Supposing we could find some way that this wouldn't be used for raiding purposes in the wording of this legislation. Are you going to imply then that these great corporations in America would refuse to comply with the wishes of the Government?

Dr. WOLFLE. No.

Mr. WOLF. There is the implication that it would be incomplete. Don't you think they would have just as much to gain by having this information in the hands of the Defense Department as the rest of the people, you might say, the Government?

Dr. WOLFLE. Some of them will certainly wish not to have raiding, but you can remove this fear if it is clearly not going to be used for employment purposes.

Mr. WOLF. You see, right now one of our problems in the Government I think is the raiding that is going on constantly in our military forces by private industry. They don't hesitate a bit from going in and bidding for the services of some of our top military people. I think this would give us the same opportunity. The military register is wide open to anyone who wants to check it, and they don't hesitate from going in and taking a key person from the military services and offering him a fantastic salary, taking him out of service.

The CHAIRMAN. Would the gentleman yield?

Mr. WOLF. Certainly.

The CHAIRMAN. I got notice this morning that a subcommittee of the Armed Services Committee is proceeding with its own investigation along that line, to determine the number of transfers from raiding, from voluntary and involuntary retirement, and what should be done to stop that procedure.

That would fit into what you just said.

Mr. WOLF. The other question that I had, Mr. Chairman, is not directed at him particularly, but I was wondering if there has been any research done as yet by our committee as to the cost of establishing this program.

The CHAIRMAN. There has been some testimony.

Do you have any idea as to what it would cost, Doctor?

Dr. WOLFLE. My ideas would be only most general and casual.

The experience is, I am sure, available, and the most recent experience is the National Science Foundation's as to what it costs per registrant.

The CHAIRMAN. Well, the National Science Foundation is already doing this, but not completely, so it should not cost a great deal more than what they are spending at this time. Is that in harmony with your ideas?

Dr. WOLFLE. It should not cost a great deal more unless one wants to expand greatly the coverage, and then you do add to the cost.

The CHAIRMAN. Well, we would want to expand it so as to make it complete.

Mr. DADDARIO. Would you yield, Mr. Chairman?

The CHAIRMAN. Well, Mr. Wolf?

Mr. WOLF. I would be happy to yield.

Mr. DADDARIO. On that point, too, Doctor, would depend the key question you asked concerning your second use, and that is referring to the Department of Defense and the other related agencies; would they use this information or would they not, insofar as the moneys needed to expand into that kind of program. That question would first have to be answered.

That is all.

The CHAIRMAN. Do you have further questions?

Mr. HALL. I have one more he touched on a moment ago.

You say that there have been efforts on the part of private industry or private initiative to create a national register such as in the legal profession, Martindale-Hubbell, which lists every attorney in the United States. To what extent have those efforts been successful?

Dr. WOLFLE. There are a number of specialized directories. Usually they are membership directories rather than the Martindale-Hubbell kind. In science the closest thing is the publication "American Men of Science" which has been published for the last 50 years or so and is now in about the 10th edition. That is an effort to give name, address, field of interest, educational background, and so on, of all of the people who qualify against a not very definite criterion. There is nothing in science quite so specific as being admitted to legal practice, so the effort in this directory is to include all people with a doctor's degree or who through experience or other education are judged equivalent. It is, therefore, a selective list in that it is the upper group.

It now totals about—the forthcoming edition will include about a hundred thousand names.

Mr. HALL. Martindale-Hubbell lists all, supposedly, and then there are select lists published also with reference to attorneys who work for banks or purely corporate work or real estate, that sort of thing, which would be analogous to the breakdown in chemical engineering, and so forth.

Dr. WOLFLE. There is also in the files of the National Academy of Sciences a record of all of the people who have earned the doctor's degree in science from 1936 on. This is a complete record from that point in time on.

Mr. HALL. Do you mean any place in this country, at any college that grants a Ph. D.?

Dr. WOLFLE. Yes.

Mr. HALL. That is all.

The CHAIRMAN. Doctor, I want to ask you another thing. I am working on a proposed bill.[1] Have you seen a copy of that?

Dr. WOLFLE. I have; yes.

The CHAIRMAN. Does that look all right to you?

Dr. WOLFLE. In terms of its subject and purpose it looks fine. I do not know whether legislation is needed to get this done. Without reference to the legislative question, yes, I would be happy to see these several groups of people representing the different interested agencies getting together and consider seriously some of the problems we have been talking about.

The CHAIRMAN. Well, thank you very much, Doctor. We appreciate very much your fine testimony.

Now we have one more witness this morning. We have Mr. Allen O. Gamble. Is it Dr. Gamble?

Dr. GAMBLE. Yes, sir.

The CHAIRMAN. Examinations and Standards Officer, National Aeronautics and Space Administration.

We are happy to have you here, Dr. Gamble, and I notice that you have a prepared statement, so the committee will be glad to have that statement from you.

STATEMENT OF DR. ALLEN O. GAMBLE, CHIEF, EXAMINATIONS AND STANDARDS DIVISION, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Dr. GAMBLE. Gentlemen, I am glad to be before you this morning. My name is Allen O. Gamble. I work for the National Aeroautics and Space Administration. I know that the NASA is one of your prime responsibilities and interests, but I was not called here because I work for that agency. I was called primarily because of my former position as head of the National Register of Scientific and Technical Personnel. The Register, as you doubtless know, is in the National Science Foundation. I am extremely pleased that this committee is showing such interest in the Nation's resources of highly trained manpower, and specifically in the National Register.

I have brought with me Mr. Benjamin D. Edwards, for two reasons. He worked with me on the Register for over 2 years, and secondly, he is my assistant now at NASA. Together we will be able to give you gentlemen more information than either one of us separately. With your permission, he is available to sit here with me or to answer direct questions.

The CHAIRMAN. May I ask you this question. Have you now been transferred from National Science Foundation to NASA?

Dr. GAMBLE. As of last November.

You probably wish to know something about my background. I hold the bachelor's degree from Duke University, the master's degree from Birmingham-Southern College, and the doctorate in industrial

[1] The bill referred to is H.R. 7981.

psychology from the University of California in Berkeley. I am a diplomate in industrial psychology, granted by the American Board of Examiners in Professional Psychology of the American Psychological Association.

I have been in professional personnel work, or closely related work, for 20 years, mostly in the areas of testing and selection, recruiting, training, performance, evaluation, and manpower information. I served first in the personnel office of the Department of Labor from 1939 to 1942; then as a Reserve officer in the Navy for 3½ years, testing naval aviation cadets; then for 9 years in the National Advisory Committee for Aeronautics, mostly concerned with recruiting, selecting, and training scientists and engineers; then 3 years as head of the National Register of Scientific and Technical Personnel, until November 1958; and now back with the NACA just after it was converted into the new NASA.

I have been asked to speak to three questions: My own experience with operation of the register, comments and recommendations concerning its present operation, and comments concerning the proposed legislation.

First let me recall for you a few facts concerning the establishment of the present register, and mention briefly its predecessors. The first major register or roster of professionals was started in World War I by the National Research Council. It was too late to be of much service. In World War II the National Roster of Scientific and Specialized Personnel was a very large and active operation. Mr. James O'Brien, who testified yesterday before you, was its executive director. The roster died in 1947 from lack of financial support. But its absence was felt. The very next year two registers were set up by the Office of Naval Research, one for top scientists and one for top engineers. These lasted until 1949. Then the next year in the U.S. Office of Education the National Scientific Register was established, also run by Mr. O'Brien.

All of these four registers or rosters were established by executive action, not by law, in response to a felt need for detailed information about highly trained scientific and technical personnel.

In 1950 the National Science Foundation Act became law. Included in it was the following provision:

SEC. 3. (a) The Foundation is authorized and directed—

* * * * * * *

(8) To maintain a register of scientific and technical personnel and and in other ways provide a central clearinghouse for information concerning all scientific and technical personnel in the United States, including its Territories and possessions.

Notice that this made the register one of the eight basic functions of the Foundation. By another section the old national roster's records were transferred to the new register, and by administrative action—incidentally, in accord with the intent of Congress as expressed in the Congressional Record and committee reports—the records of the Office of Naval Research registers and the Office of Education register were likewise transferred, thus providing complete continuity of the series of registers.

Now for the first time the register was solidly based on law. In order to determine the intent of the Congress, I have made a de-

tailed study of all references to the register in the debates and studies leading to passage of the National Science Foundation Act, 1945 to 1950. My analysis showed that Congress intended the register to have the following characteristics:

1. Permanent and continuing.
2. Serving as the one central national register.
3. Registering normally on a voluntary basis, possibly on an automatic or mandatory basis.
4. Registering intensively, as completely as feasible.
5. Covering a broad range of fields, rather than selected areas.
6. Covering qualification levels inclusively, not just the top levels.

Incidentally, these last two, 5 and 6, are important with reference to the statistical information we are speaking of.

7. Determining qualifications through the professional societies, or judgment of scientists by scientists.
8. Cooperating closely with professional societies in registering operations.
9. Prepared to serve the Nation in time of emergency.
10. Useful in many ways during peacetime.
11. Up-to-date, live, active.
12. Decentralized for most operations, with a relatively small but adequate central staff.

This I judged to be the intent of Congress, based on analysis of the complete Congressional Record, all of the dozens of bills introduced during the 5-year period, and all of the committee reports. Incidentally, this did not include testimony before committees but only what is stated as part of the official records.

From my experiences in the registering field, my major conclusion is that scientific manpower and register programs require significant amounts of money, and in competition for high rank among many important projects they have not enjoyed large amounts of monetary support. The roster was big and active during wartime, so perhaps there developed the feeling that minimal monetary support in peacetime was indicated. The present register was therefore interpreted, perhaps, to be a minor standby operation to be expanded during a national emergency.

There is, of course, a real need for accurate and current information on the Nation's scientific manpower resources. We are now in a state of deadly serious competition in science and technology. Scientists and engineers are probably our most valuable national resource in this competition. And we know all too little about them in terms of numbers, kinds, locations, utilization, special skills like foreign languages, and changes in these and other aspects with passage of time. Our information is not as complete, detailed, accurate, or up to date as I would desire. Without adequate information, the Nation cannot take proper steps, whether in education or utilization, to make the most of our resources of highly skilled talent. Without knowing who our specialists are and their numbers, we cannot channel precisely our training activities to expand the supply to meet new national program needs (radio astronomy, for example). We limit ourselves otherwise to more or less unplanned activity. Education and training should not just grow: a sense of direction and purpose seems needed.

The matter of understandable scientific specialty classifications is one of the most important aspects of the Nation's scientific manpower problem. There is a need to determine what are realistic, scientific, and technical specializations based upon what the scientific populations themselves actually use and find practical in doing their day-to-day work. This is one of the major recommendations of the National Science Foundation Report 58–28, which if you gentlemen do not have can readily be supplied to you. This is the study made in 1958 referred to by Dr. Wolfle a few minute ago, "A Program for National Information on Scientific and Technical Personnel." This point concerning the importance of getting up-to-date specialty classifications was also emphasized yesterday by Mr. O'Brien. Determining the correct scientific specializations makes it possible for everyone interested in scientific manpower, education, and information distribution matters to have one national system so designed and operated that it fulfills reasonably well the data needs of users, such as the Congress, the executive branch, the scientific community, educational institutions, and others.

I should state that the present operation of the register seems to be headed in the right direction. Somewhat more support has become available. For example, instead of registering less than 3 percent of engineers, there is a proposal to move into more complete coverage of selected fields of engineering. And instead of publishing data 3 to 5 years after original collection, there is more equipment and slightly more staff for processing the data.

I do not know the specific plans of the National Science Foundation for augmenting the register program, so I do not know for sure whether the proposed committee is needed to obtain an adequate program in the registration of scientific manpower.

However, let me add that as a private citizen and as an individual who is deeply interested in scientific manpower information programs, that personally I favor the proposed legislation.

Thank you very much.

The CHAIRMAN. Thank you very much, Doctor. Your statement is just as clear as can be. I note that the National Science Foundation has this authority and you refer to what the authority covers. You have a permanent and a continuing register, but the one thing I noticed you did not state was that it was a complete register.

Dr. GAMBLE. As of now it is not.

The CHAIRMAN. You advocate an accurate and complete register. Then we would be getting somewhere.

Now, has there been an effort made by the National Science Foundation to obtain an accurate and complete register?

Dr. GAMBLE. There has been a very vigorous effort within the limits of funds and support. However, the register now covers some 175,000 out of a total population of about 250,000 or so professional scientists.

The CHAIRMAN. Well, now someone this morning referred to perhaps around a million scientists and engineers.

Mr. GAMBLE. And engineers?

The CHAIRMAN. Yes.

Dr. GAMBLE. Engineers are considered as separate from scientists and probably total say 750,000 or thereabouts. No one is sure. That

is one of the problems. The two together, scientists and engineers, do constitute around a million.

Now, of the engineers only 15,000 to 25,000 are registered now, that is only about 3 percents of the total of engineers. This is done through a so-called finders list operation in which only a few selected engineers give information concerning themselves so that in case of national emergency they can be called upon to provide the names of additional engineers. The disadvantage here is that this is a small selected population, so no useful statistical data therefore come from this information with reference to engineers as a whole.

The CHAIRMAN. And it is not kept up to date either, is it?

Dr. GAMBLE. This is another difficulty, the keeping of the register, both of engineers and scientists up to date, including addresses, changes in occupation, additional education, geographical location, type of employer, et cetera.

The CHAIRMAN. I would rather think that it is worse to have that type of register than it would be to have no register at all because you think you have got a register of scientists whereas it is not current and it is not complete and you are really fooling yourselves when you do that. Is that true?

Dr. GAMBLE. The register would be far more useful if it had complete coverage and far more useful if it were maintained up to date rather than an average lag of 3 years in updating information.

The CHAIRMAN. So you are 3 years behind on the registration?

Dr. GAMBLE. This is the approximate cycle of updating or reregistration every 2 to 3 years that the register has been on since January 1, 1953, when it took over the old National Scientific Register from the Office of Education.

The CHAIRMAN. Well, you are actually further behind than that, are you not? For instance, with the engineers you only have 3 percent of the engineers.

Dr. GAMBLE. That is correct, the coverage is small, the information is not up to date.

The CHAIRMAN. With other types of scientists, certainly some types of engineers are scientists, are they not?

Dr. GAMBLE. That is true. It depends upon one's definition. If a person with a degree in science or a degree in engineering is doing research work, personally I think he should be called a scientist because his operations are research.

The CHAIRMAN. You would not include the engineers that are not doing scientific work or that have a degree?

Dr. GAMBLE. If you want to register only scientists, a good many engineers would be in. However, the wording of the act is to maintain a register of scientific and technical personnel, which would include engineers.

The CHAIRMAN. And that would include about how many people?

Dr. GAMBLE. About a million all told, roughly.

The CHAIRMAN. And actually we have tabulated how many, would you say?

Dr. GAMBLE. I would say a total of 175,000 or thereabouts, according to my latest information.

The CHAIRMAN. So we have about 8 percent—no, about 18 percent.

Dr. GAMBLE. I guess this is right. I have no slide rule.

The CHAIRMAN. 200,000 out of a million would be 20 percent.

Dr. GAMBLE. Yes, a good estimate.

The CHAIRMAN. It is somewhere below 20 percent, anyway.

Dr. GAMBLE. Yes.

The CHAIRMAN. And that is the extent of our efforts in reference to this at the present time?

Dr. GAMBLE. That is correct.

The CHAIRMAN. Now, I noticed when the bill came through, the appropriation bill to provide more money for this purpose, that money was cut. It indicates a lack of awareness on the part of Congress of the need of such additional money.

Dr. GAMBLE. I am delighted to see this committee is very much interested in scientific and technical manpower information and is so aware of its importance. Perhaps this can provide the basis for more support, both moral and financial.

The CHAIRMAN. You have seen a copy of this bill that I have been working on. What is your reaction toward that?

Dr. GAMBLE. Speaking as a private citizen and as an individual who is deeply interested in scientific manpower information programs, I personally favor this proposed legislation. I would say that there might be some additional emphasis, in line with Dr. Wolfle's comments on the uses to which it would be put, because this does have a direct bearing on the manner in which a register operates.

The CHAIRMAN. You would write in the law itself the uses to which the register may be put?

Dr. GAMBLE. Not into this proposed legislation, sir, but into the list of items which the committee is charged to study, so that they then can report recommended uses to your committee with reference to possible future legislation.

The CHAIRMAN. I am thinking of this thing from a standpoint of economy in Government. Now, if we allow lopsided development of our scientists from the point of population, it is going to cost a great deal to obtain the services of one type of scientist whereas if there was an abundant supply of that type of scientist, you would not have that competitive situation. I think regardless of the comfort of knowing you have available scientists, the thought that you have a possibility of actually saving the Government money in the long run would also be of interest to everyone.

Could you comment on that?

Dr. GAMBLE. I agree. I think that with reference to demand, which is a very difficult matter to estimate, that the more detailed, the more accurate the information concerning supply that one has, the better the estimates of demand will be. This is also true of utilization, as you were saying; the best uses of our scientists can be made on the basis of most detailed and current and complete information concerning their present occupations, where they are occupied and in what types of field, et cetera.

The CHAIRMAN. It has peculiar ways of working out. For instance, if industry feels there is a shortage of certain types of scientists that that industry may need, the tendency is to begin to hoard that type of individual and not release him to another industry when the other industry may have need for him. That happened during the war with

doctors. There was a tendency on the part of the military to hoard doctors over and above their normal needs in the military organization. And that was because of the shortage of doctors. That is one tendency that I think industry too might be guilty of to some extent.

Are there any questions?

Mr. DADDARIO. Yes, Mr. Chairman.

The CHAIRMAN. Mr. Daddario.

Mr. DADDARIO. Dr. Gamble, do you agree with Dr. Wolfle that employment service use merits little consideration in the use of a roster?

Dr. GAMBLE. I agree in the sense that if the Register is to be as complete as possible, which in my opinion is highly desirable, and if it is to be for that reason ready for mobilization or other emergency use of a less than mobilization level, the peacetime placement operation needs to be distinct from and separated from these other uses. I believe that industry in particular, largely industry, needs to be asked to cooperate and that industry will be quite reluctant for the most part to cooperate if here is a possibility of peacetime—excepting extreme need of the Federal Government—peacetime placement uses.

I do think that the professional societies can perform a useful peacetime placement function. I think that certain commercial operations for peacetime placement can likewise perform a useful function. However, there are cases of large industries where cooperation is forthcoming even though there might be some placement use of a Federal register or roster. Some industries came to me when I was head of the Register who were interested in complete coverage even though there might be some chance of losing their men.

Mr. DADDARIO. Well, then we get to the next question. If we consider a very important use of this to be in the event of emergency or mobilization, how would you suggest that we could use the roster effectively, under such emergency situations, taking into consideration the time elements involved, the suddenness of a possible attack, let us say?

Dr. GAMBLE. I think that the emergency use of the Register was considered to be its prime use back when the present Register started in 1953. I think that this has had a bad effect on the growth of the Register because it made it a standby operation.

With reference to emergency use I suspect that modern warfare is such that we would have little time to prepare, little time to call scientists by using the Register. I think if international tension increases to the extent that certain Federal operations or federally funded operations need additional technical personnel or scientists, the Register could be a very useful operation. Or in a brush-fire war or say one comparable to Korea, I think that again it would be highly useful. But in the event of a sudden all-out nuclear attack I am not at all sure. I think the Register should stand on other grounds in addition, and one of the major ones is statistical information for guidance of education, for guidance of utilization, for guidance of legislation by the Congress, et cetera.

Mr. DADDARIO. If you take your third characteristic in the list that you have, you have registering normally on a voluntary basis, possibly on an automatic or mandatory basis. Could you not translate that also into the use of a register under emergency situations by having personnel placed in such a position that they could be auto-

matically utilized on a mandatory basis? Not just register them as such, but to have that study made during the course of the formation of the Register so that personnel could be propertly utilized on that basis during emergency conditions?

Dr. GAMBLE. By automatic registering you mean such as when individuals leave college or university?

Mr. DADDARIO. No; I am carrying forth your theory of automatically registering them to the use of automatically using them during the time of emergency as they are shown on the Register.

Mr. HALL. Will the gentleman yield?

Mr. DADDARIO. Yes.

Mr. HALL. I believe that what Dr. Gamble had to say there was his analysis of what the legislation was with respect to the creation and operation of this Register rather than the use to which it might be put.

Mr. DADDARIO. I understand that, Mr. Hall, and what I am trying to do is translate that thought, to get his opinion on the utilization of the automatic or mandatory provision for the use of people once they are on the Register.

Dr. GAMBLE. This might fall into two categories. Prior to an emergency there might be certain individuals earmarked for specific positions when the emergency arises. This would be part of what you had in mind?

Mr. DADDARIO. Yes.

Dr. GAMBLE. However in case of an emergency there would also be unanticipated needs. Here the rest of the Register could be used to call upon specialists as the need arises. We might for example find we need language specialists who are scientists but not know this in advance. The Register, knowing who they are and where they are, being able to find them in terms of both language skill and scientific skill, could find them on call.

Mr. DADDARIO. To get across this problem that involves the use of such personnel during emergency, there are things which could be done to make the use of such personnel effective even under the utmost type of emergency.

Dr. GAMBLE. This I think is true. However, here we need to, or the proposed committee would need to go into the Department of Defense, the OCDM and other agencies to find out what these anticipated needs might be, and gear the Register for such use. One needs to know what the needs would be in rather specific terms to earmark individuals or blocks or types of individuals.

Incidentally, I might explain the reason for this No. 3, "Registering normally on a voluntary basis, possibly on an automatic or mandatory basis." When you go back to the history of the development, the first phraseology in the bills which developed into the National Science Foundation Act had an additional sentence that "No individual shall be listed in such Register without his consent." This was struck by the Congress back about 1950, and I believe the purpose was just to allow for automatic or mandatory registration, so that either if it were desirable in the national interest or if in an emergency it became highly important, there would be no inhibiting phraseology in the law.

Mr. DADDARIO. Doctor, I believe that a register is extremely important, and I wouldn't want to have stand in its way the fact that it may be difficult to use under such emergency conditions. I do believe that something can be done, and that a study could show how such a registry could be of extreme importance during such conditions.

Dr. GAMBLE. I agree.

Mr. DADDARIO. That is all, Mr. Chairman.

The CHAIRMAN. Mr. Hall.

Mr. HALL. Following that a little further, do you think there should be spelled out specifically by legislative act a requirement that under these conditions that Mr. Daddario speaks of—not a requirement, but a provision that under these conditions that he speaks of, that it should be automatic or mandatory?

Dr. GAMBLE. That is, that registration would be, or use of those registered?

Mr. HALL. Well, both.

Dr. GAMBLE. I am not sure that this is essential. I suspect that if the automatic use were provided in the law, that this might inhibit certain scientists from submitting information about themselves unless it were mandatory to submit it. In other words, the two I think would have to be tied together.

On the other hand, I think that it is well known by all scientists that in the event of national emergency their first loyalty is to their country, and that by being in the Register they are much more likely to be called to do work with which they are familiar and in which they are skilled, while if they are called by the Selective Service System or something else, they might get into work for which they are not so well qualified or which would not utilize their highest skills.

Mr. HALL. Wind up in the Medical Corps.

Dr. GAMBLE. Or whatever.

Mr. HALL. Doctor, while you were head of this Register, did you make any recommendations for expanded services?

Dr. GAMBLE. I did, definitely.

Mr. HALL. What were those recommendations?

Dr. GAMBLE. My recommendations were in three parts or sections. The first five recommendations were aimed at increasing the technical capacity or competence of the Register, in relationship to its goals and functions as established under law and as required to serve the national interest. They were as follows:

Recommendation 1: Expand input-processing facilities at the Register Records Center. The objective was to speed up and make more efficient such operations as checking incoming questionnaires, microfilming, card punching, reproducing, sorting, filing, et cetera, so as to eliminate the 2- to 3-year backlog, provide better mobilization readiness, and make manpower statistics more quickly available. Additional space, equipment, staff, and funds were requested in specific terms.

Recommendation 2: Install current-address system. The Register depends on professional societies for addresses of their members, and the addresses of nonmembers are several years old in most cases. Current addresses are needed on a continuous basis for a variety of purposes including mobilization readiness, updating of substantive

information, statistical studies in terms of geographical location, preparation of specialized directories, et cetera. Since mailing addresses of scientists change on the average about 30 percent a year, a real problem exists. A specific solution to the problem was developed and proposed, including optical scanning and other equipment, procedures, costs, and scheduling.

Recommendation 3: Develop and install systems of updating substantive information. This proposal was to modify the existing system of complete requestionnairing of scientists every 2 or 3 years, by separate treatment of three categories of information. Category I would include personal and historical information such as name, date of birth, sex, citizenship, and educational history. Such information, once incorporated into Register files, normally does not change and should not be requested again from the scientist except to have him check it periodically. This would eliminate a source of justified complaints from scientists. Category II would include qualifications information such as field and specialties of primary competence, major professional functions, knowledge of foreign languages and areas, et cetera. Updating such information could be done every 2 or 3 years without great loss of accuracy, again reducing the load on the reporting scientist. Category III would be limited to employment information: employment status (full-time employed, student, et cetera), type of employer, locality of employment, employment specialty and function, and salary. This type of data changes quite rapidly. It should be updated at every change of address, otherwise at internals of 6 months to 1 year, using a condensed type of checklist questionnaire. This proposal to treat the three categories separately was advanced as requiring some rather difficult technical development but little or no additional funds.

Recommendation 4: Develop improved classification of scientific and technical specialities. No present system of classification, including that of the Register, is fully satisfactory for all of the purposes it must serve. A system should be developed which is (*a*) up to date, since the present system is a modification of the one developed in World War II; (*b*) covers all of science and technology; (*c*) of reasonable length; (*d*) flexible and expandable to accommodate future growth in any direction, including the unexpected; (*e*) constructed in block or hierarchical form to allow different levels of fineness of treatment; (*f*) compatible with other systems such as those of Census and Bureau of Labor Statistics, past and present, so as to allow studies of historical trends; and (*g*) has a coding scheme suitable for machine handling and is compatible with the preceding criteria. It was recommended that at least one full-time Register staff member be appointed or assigned to this project. Incidentally, the Register central staff consists of three professionals and two secretaries.

Recommendation 5: Develop methods for collecting and using qualitative information. This recommendation proposes that an intensive study be made of the difficult problem of measuring the quality or excellence of scientists and engineers. About a dozen possibilities were listed and discussed.

Action on the preceding five recommendations was proposed to be taken as the first step, in order to strengthen the Register's technical capacity and competence. The following seven recommendations

were then intended to increase the active usefulness of the Register and make it better known to the scientific and technical community, to users of Register information, and to the Nation generally. One particular objective would be to provide feedback of useful service and information to registrants, in return for their work in providing information concerning themselves.

Recommendation 6: Expand output-processing capacity of the Register Records Center. This recommendation refers to statistical analyses of various types, IBM tape listings of specialized selected groups, production of mailing address labels for specialized groups and so forth. Although the Register is the richest and in many ways the best source of information concerning the Nation's scientists, output of information has been slow and meager. Both equipment and staff have been badly needed.

Recommendation 7: Obtain authority for cost reimbursable operations. It was recommended that authority be obtained for the Register to charge on a cost reimbursable basis for certain services rendered. Such charges would apply only to special purpose analyses of interest to a requesting individual or organization.

Recommendation 8: Provide selective mailing lists of registrants to qualified organizations. Once the Register has become operational with its proposed current address system, Recommendation 2, it is proposed that mailing lists be made available to Government agencies and nonprofit institutions. Use of such lists would probably be restricted to mailing notices of availability of technical information of interest to the particular selected list, such as translations of Russian documents in astronautics to specialists in space science. Each such mailing would be accompanied by two statements: (1) that the name and address had been furnished by the National Register; and (2) that, if the recipient objects to having his name and address so used, he should notify the Register.

Recommendation 9: Make Register information available for publication of special directories, jointly with professional societies. Once the proposed current address system is in operation, it would be technically easy for the Register to sort special lists of scientists or engineers and produce condensed directories of specialists. Such directories could include all specialists in a narrow field of work, all in a given metropolitan area, and so forth. They could be issued within days of receipt of latest address, rather than the usual year or more for the typical specialized directory. They would facilitate intercommunication among scientists in the same specialty or area, or having the same language skills, and so forth, to the benefit of national progress in science. Safeguards would be used to prevent commercial exploitation, and the work would be done in cooperation with the professional societies.

Recommendation 10: Allow society placement services to use Register information for referrals. This is a proposal for investigation of feasibility, followed by action if indicated. It would assist professional societies to use Register information for peacetime placement operations, insofar as individual registrants agreed in writing, and would avoid the disadvantages of a Federal peacetime placement activity.

Recommendation 11. Intensify, broaden, and cross-check registration within present fields of coverage. This is a modest proposal—increase of 10 percent to 15 percent in grants to professional societies—to increase coverage in present fields of physical and life sciences. A variety of specific approaches is listed.

Recommendation 12. Conduct publicity and information campaign. If the Register is to be a live and maximally useful organization, it must be known and understood by the population it covers, the organization it serves or will serve in peacetime or emergency, and by the Nation which supports it through tax funds. The better known the Register is, the higher the response rate to its questionnaires and the more useful its services can be. Several suggestions for action were outlined.

The above 12 recommendations concern operation of the Register within its present fields of coverage. All should take priority over expansion into new fields.

But as soon as significant progress on the preceding recommendations has been achieved or is well underway, the Register should begin expansion into new fields of critical national importance. Among these are aeronautical and astronautical science, electronics and communications, metallurgy and ceramics, rockets and missiles, and so forth. Immediately thereafter, expansion should be extended into the other areas of engineering and technology.

Mr. HALL. Could you furnish us with a copy of that report, or was it in a number of reports?

Dr. GAMBLE. This was a report prepared in March 1958, the first part of which was the historical study and legislative analysis referred to earlier. This was followed by an analysis of the detailed operation of the Register as it was then proceeding, followed in turn by an analysis of the opportunity and the challenge that the Register has, the uses which it can serve, and the services which it can provide. The last part of the report was the list of 12 recommendations for improvement and a general recommendation for expansion. This was prepared, however, at the request of the Foundation, and being prepared on request while I was an employee, it is a National Science Foundation document, in my opinion. I would be glad to give it to you, but I am not sure whether I should. So I think this is up to you, gentlemen.

Mr. HALL. For what reason are you not sure whether you should give it to us?

Dr. GAMBLE. I am just in doubt, that is all.

Mr. DADDARIO. Couldn't we request that from the Department where you were?

The CHAIRMAN. Mr. Yeager, you are handling this. Will you make the request for that document?

Mr. YEAGER. Yes, sir. And while the matter is up, Mr. Chairman, I would like to ask the permission of the committee to incorporate a number of additional views in the record which we don't have time to hear personally. For example, from the OCDM, from Civil Service, and the National Science Foundation, itself, has some additional material which they would like to have incorporated in the record.

The CHAIRMAN. If there is no objection, they will be incorporated in the record.

(Material referred to will be found in the appendix, p. 837.)

Mr. HALL. Dr. Gamble, what is the amount of money that is presently being expended, if you know, or was being expended when you left your position with this registry at the time that you left?

Dr. GAMBLE. Well, let's see, the Register started and became operational January 1, 1953. For about 5 years thereafter, including most of the time that I was with the Register, it ran about 180,000 to 200,000 a year.

Mr. HALL. And that came out of the National Science Foundation funds?

Dr. GAMBLE. This was the National Science Foundation funds.

The average cost was less than $200,000, and for fiscal 1957 to 1958 it was just over $200,000, all for grants and contracts to professional societies and the Register Records Center.

Mr. HALL. What, in your opinion, would be the necessary additional expenditure to bring it up to the level which you say is required by your analysis of the history of the legislation and the legislation itself?

Dr. GAMBLE. Well, first, the Foundation has already increased funds somewhat. In order to fulfill these points which I made a few minutes ago——

Mr. HALL. Not the ones you recommended. I am talking about the ones you had set out in your analyses——

Dr. GAMBLE. These are the same. I was trying to recall them from memory, that is, these recommendations that I was listing a few minutes ago are in that same summary.

Mr. HALL. Are they a part of what you consider the legislative requirements were?

Dr. GAMBLE. Well, the legislative requirements, when translated into proposals for action, produced this list which I just enumerated a few minutes ago. So they are tied intimately together.

Mr. HALL. All right.

So what would be the additional amount of funds required to bring it up to the point where you are implementing all of the recommendations that you have made?

Dr. GAMBLE. This is a difficult question. I can give a rough figure, I suppose.

I would say that to increase coverage to virtually the entire population, to maintain it as current as possible, and to provide the recommended analyses and services, probably there should be two to three million dollars a year.

Mr. HALL. In addition, or including the present budget?

Dr. GAMBLE. In total.

Mr. HALL. All right; now, getting back to my question a moment ago about facilities and equipment, do you have an opinion as to whether or not it would be desirable to maintain in the National Science Foundation and in conjunction with this list of scientific and engineering personnel an inventory of facilities and resources?

Dr. GAMBLE. Yes; there has been a study of facilities in the Federal Government, made by the National Science Foundation, of organizations for research and facilities for research. I believe that this same type of inventory of facilities can and should be made both of industry and of educational institutions and also of nonprofit research organizations.

Mr. HALL. And Government agencies?

Dr. GAMBLE. Yes, it has been done for Government agencies, but I believe the whole thing should be maintained on a fairly current basis and made comprehensive.

This would be of use to the Nation. I am not sure to what extent industry would be reluctant to give information which is of a proprietary type or which might provide information that would be of advantage to competitors. But under proper safeguards, I think that this could be done.

Also, I do not know to what extent the Department of Defense may now have such information in certain areas.

Mr. HALL. Do we have anybody from the Department of Defense here?

Obviously not.

Mr. YEAGER. No, sir.

Dr. GAMBLE. Also, I am not sure but that OCDM might have some information along these lines.

The CHAIRMAN. We are going to file a statement from OCDM with reference to their views.

Mr. HALL. I notice that you are a Duke graduate.

Do you know of a facility in the State of North Carolina, which recently has been created, known as the Research Triangle?

Dr. GAMBLE. That I do. It is between Chapel Hill and Raleigh and Durham, right near the airport, and it is supported by the State and by industry in the State and is a very promising operation for the State of North Carolina and for the three universities involved, which are at the points of the triangle.

Mr. HALL. I have had some connection with that Foundation. It is a nonprofit foundation that operates, this Research Triangle, by drawing together the various research facilities of the three universities or colleges or institutions of higher learning, together with their some 2,250,000 volumes in the libraries, and some 9 million documents and 850 scientists on the faculties, and that sort of thing.

I was surprised to learn that very few people here in Washington, who tell us that they have a dearth of scientific personnel when they go out to get a particular project done and are actually advertising for contract work, know about it. Some of the people in NASA knew about it, and some of the people in the Foundation had been down there—the National Science Foundation had been down there and looked at it—but in the Department of Defense they apparently knew absolutely nothing about this facility.

That is one of the reasons I am directing the question to you about an inventory of the facilities, because there we have a readymade or almost a readymade staff of scientists to start any particular project in research and development. If we have to have a time lag between the period that the concept is arrived at or it is decided to proceed with it, and the time that the agency of Government or any contractor of the Government can get its crew together to go to work on a particular project—that lag is sometimes a year or 2 years, is it not?

Dr. GAMBLE. Quite often it is. I think this is a good example of probably many other highly qualified and available research centers.

Mr. HALL. At Princeton they are doing pure research in that area, and we have another similar scientific community in the Harvard-

MIT area, and maybe another one out on the west coast. But there are only four or five of those that I know of in the country, and yet the people in the Department of Defense didn't know about this particular one, apparently.

Dr. GAMBLE. A system whereby not only the Department of Defense but other research agencies of the Government would know not only the facilities but also the available research skills of the scientists would be of great value to the Nation.

The CHAIRMAN. Are there any further questions?

Dr. GAMBLE. May I say, sir, referring to this figure which I named—of $2 million to $3 million a year—this figure is, of course, a very small proportion of the total research effort of the National Government.

I just wished to emphasize that.

Mr. HALL. Yes, sir; we realize, I believe, that the Department of Defense is going to spend something like $9 billion of its $39 billion in the field of missiles and space, and that sort of thing, and that NASA is going to spend a half billion this next fiscal year in research and development alone.

Dr. GAMBLE. May I make one more comment? I think that the committee proposed in this legislation would be able to estimate and come up with a far better figure than I can give off the top of my head.

And, may I make one final point? The total manpower program is important, not just the Register, because there are other techniques of getting information aside from the Register. The Register does not do certain things. Other types also have an essential place. But certain things the Register can do far better than any other type of approach, in my opinion.

The CHAIRMAN. Thank you very much, Doctor. We appreciate your testimony. I think it will help us a great deal.

Dr. GAMBLE. Thank you.

The CHAIRMAN. That concludes the witnesses we have this morning.

(Whereupon, at 11:45 a.m., the committee turned to other matters.)

APPENDIX

Report of the 1958 Review Panel on National Scientific Registers

[Wolfle report]

Policies for the National Register of Scientific and Technical Personnel

Because the past history, the legislative discussions, and the method of operation of the National Register of Scientific and Technical Personnel are adequately reviewed in staff papers prepared by Allen H. Gamble, dated February 1958 and March 1958, the review panel considers it unnecessary to recite any of the history which preceded its appointment, but prefers to state immediately its recommendations to the NSF and the reasons for those recommendations.

1. *The National Science Foundation should come to agreement on the purposes, policies, and scope of the Register.*

In recommendation 2, the Review Panel submits its own recommendation concerning purposes, and in recommendation 5 its suggestions concerning scope. Whether or not these recommendations are adopted, it seems to the Panel essential that members of the NSF staff come to agreement, for there is considerable evidence that lack of clear agreement concerning the scope, function, and values of a register are in substantial part responsible for the fact that the Register has now collected large masses of data but has relatively little of that data in usable form.

The number of people to whom questionnaires have been sent, the amount of information requested of respondents, and the forms in which records are expected eventually to be available, have been allowed to outrun the facilities available for processing the data. As a consequence, many addresses are out of date, data collected 2 or more years ago are not ready for tabulation and analysis, and neither the NSF nor the cooperating societies have been able to derive benefits from the Register to the extent hoped for in its planning.

The Review Panel has some doubts concerning individual items of the method of operation. To cite a single example, at least some of the societies from which information was received do not feel any need to have window cards containing microfilm copies of the questionnaires since the original questionnaires are available and are easier to read. The Panel has agreed, however, that there is no point in discussing the details of space, machine, and personnel requirements and operational procedures at this time. Agreements on the more fundamental policy matters of function and scope should precede discussion of operating details.

2. *The Panel recommends that the two purposes to be emphasized in the Register are (a) statistical studies of American scientists and their characteristics, and (b) the availability of names, addresses, and personal data for possible use under mobilization conditions.*

The Panel recognizes that there are other possible uses of a register; perhaps the outstanding one is for peacetime placement purposes. The Panel agrees with the NSF that this is not a proper function of the NSF. The Review Panel takes the position, however, that the cooperating societies should each be free to determine the extent to which it wishes to use its portions of the Register for placement purposes.

Still other functions might be developed—for example, the printing of specialized directories. The Review Panel believes that all of these other purposes are of secondary importance, and should not be permitted to interfere with the achievement of the two principal functions.

The Register can serve as a valuable source of data for the Foundation's clearinghouse of information function, and in like manner can be used by individual societies for studies of characteristics of the persons within the field of interest of those societies.

The usefulness of the Register as a source of statistical data is limited by the fact that coverage is incomplete and by the fact that the Register itself can never give information about the total population from which the Register sample is drawn. Despite this limitation, the members of the Panel feel confident of their own judgment that rapid and prompt analysis and publication of statistical information from recently collected questionnaires would be of value to institutions and individuals interested in the trends and changing characteristics of America's scientific population. On this point we ask if the Foundation itself feels satisfied that its programs and its recommendations to Congress have been founded on as solid a basis of statistical information as is desirable.

With respect to the mobilization function, the Panel suggests the desirability of securing from the Office of Civil and Defense Mobilization and other potential mobilization users, information concerning the questions that are likely to be asked of the Register and how the Register information would be likely to be used under mobilization conditions. The concept of national mobilization has changed drastically during the past dozen years; the experience of World War II and the Korean war probably no longer provide the only good models of what to expect in the future. The Department of Defense, the Office of Civil and Defense Mobilization, and other defense agencies cannot, of course, state in detail all of the eventualities, but must envision various degrees of national emergency. Yet it would be of very great help in Register planning to secure from these agencies information concerning the kind of data that would be needed to answer their mobilization requirements, the degree of detail of information about any individual that would be wanted from the Register, which would probably vary for different types of individuals, and the ways in which Register information would be likely to be used. The Panel recommends that defense agencies be asked to study these matters and to advise the Foundation.

3. *The Panel recommends that all reasonable efforts be made to get the present data in usable form.*

Although much of the data are of reduced value now, analysis of the 1954 and 1956 questionnaires will be of historical interest and will help to determine trends.

4. *The Panel recommends that all reasonable efforts be made to bring the data on present registrants up to date.*

"Up to date" means accurate current addresses, deletion from the Register of deceased registrants, addition of potential registrants who have become eligible since the initial data collection, and the correction of major items of information, such as position, responsibilities, degrees, and so on, that have changed since the time of initial data collection.

5. *The Panel recommends that there be no expansion of scope of services of the Register until after the above recommendations have been carried out.*

In operating its other programs, we believe that the National Science Foundation itself does not now get from the Register the data that it would find useful. This is equally true of Congress and the executive branch as well as educational institutions, scientific societies, and the scientific population at large. Only after the above recommendations have been carried out will there be available a usable Register. After a usable Register is in existence, the Foundation and other interested agencies will be in a position to assess its value and to make reasonable estimates of the value of contemplated expansions of coverage, services, and amount of information.

6. *In future Register operation, the Panel recommends that much greater emphasis be placed upon speed, even if that emphasis requires some sacrifice of detail or completeness of coverage.*

In at least one instance, a cooperating society punched its own deck of cards before shipping the questionnaires to the Foundation. From the cards so punched the society has been able to obtain a considerable amount of useful and timely information. This is, of course, only one way in which the process of data collection, tabulation, and analysis can be speeded up. The Panel recommends that all feasible means of speeding up the operation be adopted. The mobilization function will be better served by having an accurate and up-to-date even though incomplete, Register than by having a complete Register in which a large but unknown amount of the information is inaccurate and out of date. For the purpose of statistical studies, it will be of greater interest and value to the scientific community to have current information on a sample than to have information on the entire population that is several years out of date.

In summary, the Review Panel recommends that special efforts be made to put the already collected information into usable and up-to-date form so that

the Foundation and others will have an opportunity to assess the value of an actual functioning Register. The Panel further recommends that the staff of the Foundation come to agreement upon basic Register policies with respect to scope and purpose. The Panel recommends that until these two steps have been carried out, plans for extending the scope or enlarging the function of the Register be held in abeyance.

IRA H. ABBOTT,
National Aeronautics and Space Administration.
HENRY A. BARTON,
American Institute of Physics.
ALBERT KAY,
Department of Defense.
MILTON O. LEE,
Federation of American Societies for Experimental Biology.
RAY W. MAYHEW,
Owens Illinois Glass Co.
HARRY A. WINNE,
General Electric Co.
DAEL WOLFLE,
AAAS, Chairman.

One member of the Panel (Lee) is strongly of the opinion that the scope of the Register should be narrowed. This might be accomplished either by division of the present Register into two completely separate portions, a Register of Scientific Personnel and a Register of Technical Personnel, or by amendment of the act creating the NSF to eliminate "technical personnel." The first alternative would seem to be preferable at the present, since it would involve only an administrative policy and division, and would allow opportunity to determine how well a Register of scientists only might serve. Determination of qualifications for inclusion as a "scientist" should be left to each of the cooperating organizations, with only a broadly guiding rule such as possession of a doctoral degree or its equivalent. Emphasis should be placed first on the Register of Scientific Personnel, and it should be completed and made functional before much effort was directed to the Register of Technical Personnel.

A PROGRAM FOR NATIONAL INFORMATION ON SCIENTIFIC AND TECHNICAL PERSONNEL

National Science Foundation, President's Committee on Scientists and Engineers
August 1958

PREFACE

Congress recognized the importance of information on scientific and technical personnel in the National Science Foundation Act of 1950. That act, in establishing the National Science Foundation, directed it to maintain "a register of scientific and technical personnel and in other ways provide a central clearinghouse for information covering all scientific and technical personnel in the United States, including its Territories and possessions."

Major responsibility for this activity is lodged in the Foundation's scientific manpower program within the Division of Scientific Personnel and Education. The clearinghouse operation has been essentially one of collation from many sources of existing materials, limited analysis to meet the exigencies of operating programs, and the publication or release of information considered important and timely. A limited amount of support was provided for research in new techniques and methods with the hope that better approaches might be developed in such difficult areas as demand-supply relationships, supply projections, etc.

The last few years have witnessed a sharp increase of interest in the twin subjects of science and scientific personnel. This growing concern has arisen from the intimate association of economic development and scientific advance, the recent high levels of economic activity, the growing complexity of national defense equipment, and the resulting shortages of scientific and technical skill. More recently, the remarkable advances in foreign scientific achievements have led to searching examination of our resources of scientific personnel, their training and professional characteristics, and probable future supply.

Some recent Government programs dealing with scientific manpower may be cited as indicative of this growing interest. In 1956, the President's Com-

mittee on Scientists and Engineers was established to provide leadership for non-Government programs designed to improve the quality and increase the numbers of well-qualified scientists and engineers. In 1957, National Science Foundation programs for the improvement of science teaching were sharply expanded. In 1958, further sharp increases occurred in Foundation programs, and the administration proposed new programs in support of science education. In 1957 and 1958, both the Organization for European Economic Cooperation and the North Atlantic Treaty Organization adopted new programs to encourage member countries to review their scientific manpower situations and develop similar measures.

Two developments occurring about this time are primarily responsible for this document. Early in 1957, the President's Committee on Scientists and Engineers found itself handicapped in its program development activities through lack of agreement on much of the basic statistical data relating to scientists and engineers. The Committee decided to establish a task force on statistics to evaluate existing data and propose methods of remedying deficiencies. An independent development in June 1957 was a request to the National Science Foundation by the Bureau of the Budget for the preparation of a program of collection of needed data on scientists and engineers.

The Budget Bureau's request stated in part:

"We are accordingly requesting the National Science Foundation to develop a program for collection of needed supply, demand, employment, and compensation data with respect to scientists and engineers and for such other professional groups as it considers appropriate. Because of its functions, its relationship to the National Committee for the Development of Scientists and Engineers, and because it has already arranged for studies of employment in scientific fields, we believe the Foundation is the most logical agency to undertake such a task."

The Foundation accepted this assignment and jointly with the President's Committee on Scientists and Engineers[1] organized an Advisory Panel to review and evaluate the available information on the demand and supply of scientists, engineers, technicians, and teachers of science and engineering. The Panel was asked to recommend such inquiries or other measures as in its judgment would provide the additional information needed for policy formulation in the field of scientific and technical personnel.

The members of the Advisory Panel were:

Philip M. Hauser, University of Chicago, Chairman
Philip H. Coombs, Fund for the Advancement of Education
Henry David, National Manpower Council
Coleman R. Griffith, American Council on Education
Merriam H. Trytten, National Academy of Sciences and National Research Council
Ralph J. Watkins, Brookings Institution
Dael Wolfle, American Association for the Advancement of Science

A secretariat to provide staff support to the Advisory Panel was made up of the following members of the firm of Surveys & Research Corp.:

Stuart A. Rice, Libert Ehrman, Robert H. Mugge, Lorand D. Schweng, and Jeremy C. Ulin

Representatives of several Federal Government agencies participated as consultants to the Advisory Panel. Agencies represented by these consultants were:

National Science Foundation
President's Committee on Scientists and Engineers
U.S. Department of Labor, Bureau of Labor Statistics
U.S. Department of Commerce, Bureau of the Census
U.S. Department of Health, Education, and Welfare; Office of Education and National Institutes of Health

The Bureau of the Budget, Office of Statistical Standards, was represented by observers. In addition, the Office of Defense Mobilization and the Interdepartmental Committee on Scientific Research and Development were requested to submit suggestions on the adequacy of and the needs for scientific and technical personnel information on behalf of those agencies not directly represented.

The Panel held its first meeting in July 1957 and completed its assignment in April 1958 with the discussion of its findings with a group of Government and

[1] Formerly the National Committee for the Development of Scientists and Engineers.

private industry representatives, who are, in the main, operating responsible programs dealing with scientific manpower policy and data collection.

The National Science Foundation and the President's Committee on Scientists and Engineers are deeply indebted to the members of the Advisory Panel for the time-consuming efforts which went into the preparation of its report. They provided the benefit of mature judgments developed from a wide variety of experience upon the problems of data collection and analysis. Staff review within the Foundation has resulted in some minor revisions, mainly of a nature to adapt it better to the requirements of the two sponsoring agencies. Necessarily, the report in its present form, *represents the findings and recommendations* of the two sponsoring agencies rather than those of the Advisory Panel in all respects. It is intended to serve the requirements of these agencies in meeting the Budget Bureau request for the development of a program of data collection, and in providing program guidance to the agencies themselves.

The following personnel from the sponsoring agencies participated in the project and prepared the report for publication:

National Science Foundation:

Thomas J. Mills, Program Director for Scientific Manpower
Robert W. Cain, Project Director for Scientific Manpower Studies

President's Committee on Scientists and Engineers:

Robert L. Clark, Executive Director
Eugene D. Vinogradoff, Staff Director

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INTRODUCTION

The need for scientific and technical personnel and its role in the national life of the United States have become matters of unprecedented concern. The contributions of science and technology to the enhancement of human welfare, on the one hand, and to potential holocaust, on the other, have awakened peoples throughout the world to an awareness of their impact upon contemporary life.

To insure an equilibrium between the demand for and supply of these personnel, policies will have to be formulated and plans of action will have to be carried out by public and private agencies. To create such plans and policies detailed information about such personnel is essential. Because of the recency and urgency of our present concern, however, it is not surprising that on the whole, data about the number, demand, supply, and social and economic characteristics of these personnel have not been found adequate.

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The attention of this project was concentrated upon "scientific and technical personnel." As the term is used in this report, it includes physical and life scientists, engineers, teachers of science and engineering, and scientific and engineering technicians. Although social scientists, medical practitioners, and a number of other important occupations were excluded from specific attention, it was realized that there is a strong interrelationship, both organizationally and operationally, among highly trained persons of all types. Moreover, the research required to develop information concerning scientific and technical personnel will, in many instances, require study of personnel in other fields as well.

It is not expected that all surveys and studies developed under this program will have identical coverage of scientific and specialized fields. Coverage will depend upon purposes of the particular survey. For example, one survey might cover only the salaries of physicists in industry, educational institutions, and government. Another survey might be concerned with the educational levels of scientific and technical personnel in relation to salaries. The latter study might well include those occupations considered comparable with technical ones in level of training as well. For many purposes, a proper understanding of scientific manpower requires information on other specialized occupations requiring similar levels of responsibility, training, level of abilty, etc.

At the very beginning of this project it was found that unanswered questions about scientific and technical personnel range from matters that are elementary to many that are extraordinarily complex. At one extreme is the lack of adequate concepts for delineating the occupational skills of scientific and technical personnel, so that the specific groups in the population about whom information is required have not been accurately identified. At the other extreme in terms of refinements in methodology that would be essential for obtaining information is the many-faceted question of the dimensions of the current and future demand.

Included also are questions of quality and utilization—how good are American scientists and technicians and how effectively are their skills being utilized? How well are young people being trained for scientific and technical careers? Further, what attitudes and motivations influence their vocational choices? What provisions are made for their support, counseling, and placement? What earnings and conditions of employment can they expect if they prepare themselves to become scientists or technical specialists? The Nation is ill prepared to answer these questions.

In recent years the need for information has been emphasized by considerations of national defense, and for this reason seems more pronounced than ever before in national history. The need for more information is not, however, of merely emergency character. In the absence of more facts we lack guidance not only for maintaining the Nation's safety, but also for maintaining the rates of economic growth and social progress that have enabled this Nation to enjoy the highest levels of living yet attained by any people.

Many nongovernmental organizations are of course vitally interested in scientific manpower and data collection programs concerning it. A good number of these organizations have established and continuing programs in this area. It is hoped that these agencies will find merit in the recommendations of this report and will coordinate their research efforts.

The recommendations in this report vary in urgency, and for this reason two orders of priority have been assigned them: most urgent and urgent. Each recommendation is given an identification number in sequence. Explanatory notes usually follow each recommendation, in a separate paragraph or paragraphs.

Overview and Conclusions

Information Now Available

The principal sources of data relating to the demand, supply, and utilization of scientific and technical personnel were investigated, giving particular emphasis to statistical series and other data national in scope. Some studies of narrower scope, or within specialized areas, were examined as possible models for more extensive studies.

A great deal of information useful in the analysis of the demand, supply, and utilization of scientific and technical personnel is currently available. Basic population data are provided by the Bureau of the Census by means of censuses, sample surveys, and estimates. Fertility and mortality data are furnished by the National Office of Vital Statistics. Data on immigration and emigration are tabulated by the Immigration and Naturalization Service. The Office of Educa-

tion reports enrollments, graduations, and a wide variety of other data concerning elementary and high schools and institutions of higher learning. The Bureau of Labor Statistics has made intensive studies of certain aspects of the supply and demand for scientific and technical manpower. The National Research Council assists the National Science Foundation in developing a growing body of data on recipients of earned doctorate degrees.

The National Science Foundation conducts periodic surveys of expenditures for and manpower engaged in research and development. The Foundation, in cooperation with leading professional societies, also maintains the National Register of Scientific and Technical Personnel, which provides detailed information on those who are listed, including age, sex, education, specialization, employment, and location. Several agencies within the Department of Defense and other Federal agencies have sponsored or conducted studies into the utilization of college graduates and other related questions.

The National Education Association has conducted various large-scale surveys into the characteristics of schoolteachers and the conditions affecting their work; as well as other questions concerning the Nation's schools. The American Chemical Society, the National Society for Professional Engineers, and other professional organizations have conducted surveys into characteristics of their members and others working in their respective fields. The Commission on Human Resources and Advanced Training, the National Manpower Council, and the National Bureau of Economic Research have studied questions of supply and demand with respect to highly trained manpower. The American Society for Engineering Education has completed a study of the need for engineering teachers during the next 10 years. In addition, many other useful studies made by educators, business organizations, Government agencies, associations, and foundations could be cited.

In general, it may be concluded that many data are available on easily measured characteristics of the supply of scientific and technical personnel, but these data are not sufficiently intensive and precise. On the other hand, quantitative information upon supply characteristics of a more qualitative type is scanty. Thus, no quantitative data are known for determining the degree of skill, the exact character of training, and the innate capacities of these personnel.

With respect to the demand for scientific and technical personnel, only a few tentative studies have been made and it appears that an adequate methodology to serve as a basis for more definitive work has not yet been developed. There have been fragmentary studies of the utilization of scientific and technical personnel, in which a great deal of effort was spent on classification of the present jobs of the persons. Little research has been undertaken concerning the attitudes and motivations of students and the public which might affect choices of fields and careers, or decisions for or against remaining in scientific and technical positions when alternatives are presented.

Social science research may take pride in its many important contributions to the welfare of this Nation, and in the varied and dependable statistical data upon which much of this research has rested. Yet the judgment may be expressed that, with regard to the Nation's resources of scientific and technical personnel and the demands upon them, the data found available are in general painfully inadequate. In the face of the foreseeable long-term manpower needs, the Nation cannot long afford to leave the gaps in its information unfilled and the deficiencies in data unremedied.

RECOMMENDED PROGRAM FOR OBTAINING NEEDED DATA

To provide information necessary to answer the most crucial questions relating to scientific and technical manpower, a program of 15 separate projects is recommended. Three of these, considered to be "most urgent," should be launched quickly; while those that are "urgent" should be implemented as soon thereafter as possible.

It is recognized that opinions concerning priorities may differ. However, it is believed that the three "most urgent" recommendations provide the keystones for a national information program in this field.

Most urgent.—Because of their key importance for the better understanding of the Nation's problems respecting scientific and technical personnel, the following three projects are felt to be most urgent:

Identification of scientific and technical occupations

Analysis of work content and job descriptions in scientific, technical, and related fields, to develop a set of job definitions and a classification, and to develop methods for identifying these occupational categories with adequate precision when conducting such surveys.

Pool of scientific and technical personnel

A periodic survey, using appropriate sampling techniques, of organizations and agencies of all types which are employers of scientific and technical personnel, to obtain information on the numbers and characteristics of such personnel.

From time to time intensive analyses, through personal interviews, of a subsample of present and former scientific and technical personnel, to determine the number, occupation, and economic and personal characteristics of these persons; and to obtain information concerning the nature of movement into and out of the supply.

Periodic study of the demand outlook for various categories of scientific and technical personnel in each major activity

The study would include the analysis of: (*a*) employment and production growth trends and (*b*) the changing roles of particular classes of scientific and technical personnel, to develop current estimates and forecasts of demand for such personnel by occupation and educational levels.

Urgent.—The following projects are considered to be highly urgent and are recommended for prompt implementation.

Studies of supply and utilization

1960 census survey of college graduates: Scientific, technical, and other specialized personnel

A special direct survey of a large sample of the persons recorded in the 1960 census enumeration as college graduates or as persons currently or last employed in scientific and technical positions, whether college graduates or not, to determine relationships between training and subsequent occupation.

Sample population survey

An occasional survey similar to the current population survey of the Bureau of the Census, to provide source data for estimating both the current supply of scientific and technical personnel and potential increments to it, as well as net turnover.

Analysis of data from National Register of Scientific and Technical Personnel

Continuing analysis of Register data on social and economic characteristics of scientific personnel listed, to determine age, levels of education, functions, type of employer, scientific specialization, income level, etc.

Extension of the coverage of school reporting comparison of data from diverse sources, and other educational data

Extension of school reporting

Extension of the annual and biennial statistical reporting program of the Office of Education to obtain a more complete view of the Nation's educational system, with particular reference to private schools, college enrollments, and course enrollments.

Comparison of data from diverse sources on school enrollment and educational attainment

An intensive statistical analysis to compare and coordinate Office of Education data on enrollments and graduates with Bureau of the Census data on enrollment and highest grade of school completed.

Reports of Government technical schools

Initiation of annual reports from the appropriate governmental agencies concerning technical schools for higher education operated by them, the character and extent of science instruction provided and the utilization of personnel trained in science and engineering; to determine the level and extent of such training.

Analysis of factors in school retention

Studies of the factors related to dropouts of students in various fields and of different ability levels, at particular grades in school, seeking particularly to measure the effects of financial factors.

Research into aptitudes in and attitudes toward science and engineering

Research into youth's aptitudes in and attitudes toward science and engineering

Several related types of inquiry: (*a*) to determine the distribution of youth in terms of general mental ability and other more specific aptitudes; (*b*) to measure comprehension of scientific subject matter; (*c*) to ascertain the attitudes of students toward science and engineering at several educational levels; and (*d*) to ascertain student's occupational conceptions and choice.

Followup surveys of recent college graduates

Surveys of samples of recent college graduates made 2, 4, and 6 years after graduation to learn the beginning career patterns of young graduates as these relate to their major fields of study and other personal characteristics.

Research into community attitudes toward scientific and technical personnel

Studies of the attitudes of American communities toward science and engineering and the individuals who are occupied in these fields, to determine their importance in influencing occupational choice.

Surveys of curriculums and physical facilities available for the teaching of science and engineering

Surveys of curriculums in science and engineering

Periodic surveys of the courses offered in the science and engineering programs of schools and colleges.

Surveys of physical facilities for the teaching of science

Periodic surveys to determine the adequacy of laboratory and other equipment used for the teaching of specific science and engineering courses in the Nation's schools and colleges.

Research into the quality of science instruction

Studies to determine the effectiveness of science and engineering teaching, with the principal purpose of isolating the background factors and personal qualities which characterize the most effective teachers.

Surveys of training programs in science and engineering outside the formal education system

Surveys of training programs for scientific and engineering technicians in industrial and commercial establishments

Sample surveys to obtain information on formal courses given to technicians within such establishments, including apprenticeship programs for training technicians; to determine their importance in supplementary technical training.

Surveys of advanced scientific training programs of industrial and commercial establishments

Surveys of the formal, advanced scientific and technological training programs conducted by business establishments for their scientific personnel possessing college degrees or equivalent backgrounds, to determine the level, content, and relative importance of such programs in the Nation's scientific training effort.

Study of background of scientific and technical personnel who have had no formal training

Identification of selected scientists and technicians who have received no formal training and the analysis by case studies of their background and the means through which their status was obtained; in order to appraise the possible importance of the informal training methods disclosed.

Surveys of changes in supply from immigration and emigration, retirement, other causes and death

Reports on immigration and emigration of scientific and technical personnel

Initiation of annual reports on the scientific and technical personnel of foreign citizenship who immigrate into or emigrate from this country. Study the extent and character of emigration of scientific personnel who are citizens to determine its relationship to the overall supply.

Interview survey of retirees

Special survey to be repeated periodically of a sample of retired scientific and technical personnel, designed to ascertain their ability and willingness to resume active employment full time or part time if needed.

Additional study of occupational mortality rates among scientific and technical personnel

Intensive study of differential mortality among occupational groups of scientific and technical personnel, to improve estimating methods.

Studies of demand

Correlation regressions among major determinants of demand for scientific and technical personnel

Historical studies of the regression relationships between demand series and trends in several factors hypothesized to be major determinants of demand with a view to determining the degree of predictive value which each of them may possess.

Surveys of employers' expectations of demand for scientific and technical personnel

Periodic surveys of the expectations of present and potential employers of scientific and technical personnel as to the numbers and types of such personnel they will need at specified times in the future, and as to the major factors that are expected to determine their future needs; with particular attention to lessons that may be learned for improving methods of projection.

IMPLEMENTATION

It was recognized that other projects, in addition to those recommended, may have high potential value, and the field of inquiry is growing rapidly. Furthermore, it is the view of those responsible for this project that even more research related to the Nation's needs for highly trained manpower than is now underway should be encouraged. It should be undertaken on a broad basis and should not be limited to science and technology.

Substantial parts of the program should be undertaken by State and local governmental agencies and by private organizations of many types. For the most efficient use of their research facilities, however, and also to make the greatest contribution to general knowledge, such organizations should work closely together and insofar as feasible plan their research within a coordinated framework.

The Federal Government is believed to be the proper agency to provide direction and guidance in this area. To insure prompt, efficient, and thorough implementation of this program, it is recommended that an appropriate Federal agency be given specific responsibility for coordinating that part of the work which involves Federal Government support, for analyzing and synthesizing the data produced, and for making the findings known to the American people.

I. The Problem and Its Setting

NATIONAL NEEDS FOR INFORMATION ON SCIENTIFIC AND TECHNICAL MANPOWER

In recent years, many thoughtful observers have become doubtful whether a satisfactory rate of scientific progress is being maintained in the free world and whether continued leadership in science and engineering is assured. In the United States, the Congress, the National Science Foundation, and other public and private bodies have expressed in many ways their concern about this question. One expression of this concern was the creation in 1956 of the President's Committee on Scientists and Engineers to stimulate nongovernmental efforts to increase the numbers and improve the professional quality of scientific and technical personnel.

The importance of these objectives adds significance to the question whether means exist by which the demand for and the supply of such personnel can be currently measured and forecast for the future. Science is said to be growing at an "exponential rate." Is the current supply of scientists and engineers adequate to meet current needs? In the absence of conclusive evidence, the shortages in which there is widespread belief may be illusory. Again it is asked whether the supply is growing and is likely to continue growing fast enough to meet the demands of the future? How can the character and volume of these demands for scientists and technicians be foreseen and measured?

A factor adding to the complexity of these questions has been a notable change in the Nation's demographic composition and trends. The low level of the birth rate that was reached during the economic depression of the 1930's and continued until the end of World War II has altered the traditional age structure of the population of the United States. If a shortage of scientific and technical personnel exists, as widely believed, it undoubtedly results in some measure from this cause and may well continue for the same reason during some years to come. At the same time, the well-evidenced deficiency in the numbers of persons trained and willing to teach in higher education, particularly in science subjects, is largely due to the rapid growth of college enrollments. The shortage of college teachers is almost certain to be aggravated by the boom in births that immediately followed the end of the World War II, which will shortly be reflected in even greater college enrollments.

Another pressure upon supply follows from the scientific and technological advances of the recent decades. There is circularity in such relationships. The results of the work of scientists tend to call for more scientists. Needs for scientific and technical personnel seem thus to have increased at accelerating rates. To demands related to an expanding economy have been added those related to national defense. Although the latter may sometimes dominate public attention, it should be emphasized that national defense is but one of the considerations that give importance to measures designed to increase and improve the supply of key scientific and technical personnel and to further the teaching and study of science and engineering.

A consensus on all of these vital questions and others related to them has not been reached. Allegations of current deficiencies have sometimes coincided with claims of oversupply, fortified by seeming evidence of unemployment or underemployment among persons of competence in scientific and engineering fields. Forecasts of even greater deficiencies in the supply of scientists and engineers in the future with which there is general agreement are not always supported by estimates of future demand. More facts are needed.

QUESTIONS REQUIRING ANSWERS FOR POLICY FORMULATION

In planning a program for national information on scientific and technical personnel it was necessary to identify the important questions requiring a quantitative answer. This compelled consideration of the issues which confront those who formulate national policy in this field. They can be summarized as follows:

The extent to which scientific and technical talent and skills should be encouraged and developed to increase the supply of scientists, engineers, technicians, and teachers of science;

The ways in which the teaching and study of science should be furthered and the means of doing so;

Methods of raising the standards of teaching and training to improve the quality of scientists, engineers, and technicians;

Development of the criteria for military induction, occuptional and student deferment, and Reserve screening;

Determination of the optimum level of Government-financed research;

Determination of the levels of compensation of scientific and technical personnel, both civilian and military, and of means of improving their prestige and morale;

Methods of conserving and utilizing to the greatest possible extent the available scientific and technical manpower.

With the possible exception of military induction, all the issues listed above are of long-range character. Some are the primary concern of Government agencies. Others are also of great interest to and require action by private organizations.

The issues on which data are needed for a clear assessment of the supply of and demand for personnel in science and engineering are especially numerous in a society where there exists no central control over the flow of talent into various occupations. The United States requires timely, precise, and comprehensive data as a basis for development of its manpower policies. On many counts the Nation lacks absolutely essential information; and in consequence is poorly equipped to under take this difficult and subtle task.

Reasonably precise answers to some questions, notably those connected with attitudes or motivations, are difficult to obtain. To satisfy the needs for answers in this area would require more extended research than is here proposed. For the practical purposes of policymaking, however, questions such as the following need to be answered with a fair degree of precision:

With respect to demand

For what purposes, activities, and functions are scientific and technical personnel needed? Who—industry, Government, educational institutions—needs them?

What kind of scientific and technical personnel are needed, in terms of both area of specialization and personal qualifications?

What are the most tenable forecasts for future needs of the several kinds of scientific and technical personnel?

How do trends in demand for these personnel relate to trends in per capita income; research expenditures; levels of production; college and university enrollments; defense program requirements; technological change?

In what ways will special conditions and anticipated changes in particular industries affect future demands for specialists?

With respect to supply

How many scientists, engineers, technicians, and science teachers are there—by types and location? What are their specialties? What is their background, training, experience, income?

What are the turnover rates within each of these groups?

How is the supply of scientific and technical personnel related to total population size; school facilities; attitudes of students toward science as a subject and as a career; salary scales; working conditions; economic and business conditions?

What will be the annual increments to the pool of persons completing higher education at each level (B.S., M.S., Ph. D.), both in the near and more distant future?

What is the distribution of all college graduates, by highest degree received, by level of skill, and by field of specialization—not only in broad fields but also by specific areas such as electronics, solid-state physics, hydraulics, ceramics, etc.? What is the employment distribution of technicians?

What are the best forecasts of the future supply for each of these occupational categories?

Does available evidence indicate the probability of shortages of scientific and technical personnel and science teachers at specified periods within the next one or two decades? If so, what forecasts are possible as to the size, character, industry, and geographical location of shortages? What can be done about the continuing shortages of scientific and technical personnel of exceptional ability?

What specific education and training do scientific and technical personnel receive other than in the formal academic institutions?

What is the quality of training of our scientific and technical personnel? How does that training compare with the best training now available in the United States and with training in foreign countries?

At what point in age or schooling are youth's attitudes toward science and engineering shaped? What are these attitudes and how are they derived? What considerations influence students to pursue one vocation or another? What social and psychological factors are involved? What part does family background play in setting the framework for such decisions?

What are the attitudes of the general public, businessmen, and managers toward these fields? What is the attitude of scientists and engineers toward their professions? Why do some leave these fields?

How many retired and other inactive scientific and technical persons could be returned to active work if needed?

With respect to utilization

What duties are scientific and technical personnel expected to perform in various types of establishments, and what are their actual functions? To what extent can given types of demand for these personnel be met by more appropriate utilization?

What types of training and abilities make for flexibility of skills? To what degree are special scientific capacities transferable from one type of assignment to another? What is the extent and nature of occupational mobility among scientific and technical personnel?

A large value of reasonably current data having a bearing on the supply, demand, and utilization of scientific and technical personnel was found in the course of this study. Principal sources are listed and annotated and a series of tables is included in a separate document,[2] as illustrations of the types of information that exist. The data published by the U.S. Office of Education, the U.S. Bureau of the Census, the U.S. Bureau of Labor Statistics, the National Science Foundation, the National Research Council, the Commission on Human Resources and Advanced Training, the National Bureau of Economic Research, the Educational Testing Service, the American Chemical Society, the National Education Association, the National Society of Professional Engineers, the American Society for Engineering Education, the Engineers' Joint Council, and other agencies and organizations provide a good foundation for further development.

After comparing the data available with the needs for information, it was concluded that a great deal more information is still required. General conclusions are as follows: There are many data on easily measured characteristics of the supply of scientific and technical personnel, but these data are far from being sufficiently intensive or precise. Little is known about the capacities, qualifications, and quality of scientific and technical personnel in the United States.

With respect to the demand for such personnel, only a few tentative studies have been made, and a fully adequate methodology for definitive work has yet to be developed. There have been studies of the utilization of scientific and technical personnel, but their value has been limited by, among other things, the breadth of the classification employed and by their restriction to the present jobs of the personnel involved. Only a few research studies have been undertaken on a large scale respecting the attitudes and motivations which affect choices of careers and fields of specialization or decisions for or against remaining in scientific and technical positions.

A more detailed exposition of the adequacy of information will be given in the chapters dealing with supply and demand.

The recommendations in the following sections of the report would by no means provide satisfactory answers to all of the questions listed above, even when fully effectuated. However, it is believed that the surveys and reporting suggested would provide a firmer basis than now exists for the policy decisions which must be made.

Implementation of the recommendations would require extension of existing official reporting, a special processing of existing data, new surveys, statistical and other, or combinations of some of these. The responsibilities of particular agencies and the responsibilities for synthesizing, coordinating, and analyzing the results of separate data collections should be clearly established.

II. Supply

In this report, scientists, engineers, technicians, and teachers of such personnel will be frequently grouped together under the inclusive term "scientific and technical personnel," as noted in the overview. The aggregate so designated is made up of many separate components from particular fields of specialization, and refers to personnel of varied types and different levels of ability.

The procedures for obtaining estimates of the size of the current and potential supply for subgroups will in general correspond to those used with respect to the group as a whole. In both cases measurement is complicated by occupational mobility. This analysis will usually refer to scientific and technical personnel in the aggregate, with the understanding that further refinements would be required to extend it to any particular subgroup within the aggregate.

[2] *Supplement* to A Program for National Information Scientific and Technical Personnel, Annotated Sources of Data and Illustrations of Data Available."

THE CONCEPT OF SUPPLY

The project was concerned with the measurement not only of the scientific and technical personnel immediately available but in addition of those who, given time for preparation or change of jobs, might be added to these groups. The size of the second of these two categories is affected by the time necessary for training. A comparison of the numbers of scientific and technical personnel employed as such with those unemployed or engaged in other occupations can be defined as a gage of the utilization of scientific manpower.

The conception of current supply is taken from the concept of "labor force" used by the Bureau of the Census, the Bureau of Employment Security, and other Federal agencies. Consistent with this framework the current supply of scientific and technical personnel is deemed to consist of all such personnel in the labor force; that is, those now employed in scientific, engineering, or related technical positions and those unemployed and looking for such work. The analysis of potential supply requires an extension of the labor force concept to include categories of persons not ordinarily embraced within the concept; namely, those trained but not working and not seeking work, those in training, and those who could be trained.

A schematic portrayal of these concepts and their use in measuring supply is presented in figure I. The *total population* 14 years of age and over is divided into the two main groups, persons in the labor force and persons not in the labor force. The following are descriptions of the eight segments of supply within these two groups:[8]

In the labor force—

(1) Those in scientific and technical positions at present and the unemployed who are capable of filling such positions;

(2) Those persons employed in other than scientific and technical positions who have been trained in these fields;

(3) Those who have not been so trained but whom it would be practical to train;

(4) Those whom it would not be practicable to train;

Not in the labor force—

(5) Those who have been trained in scientific or technical positions;

(6) Those now receiving such training;

(7) Those not receiving training but whom it would be practicable to train;

(8) Persons for whom such training would not be practicable.

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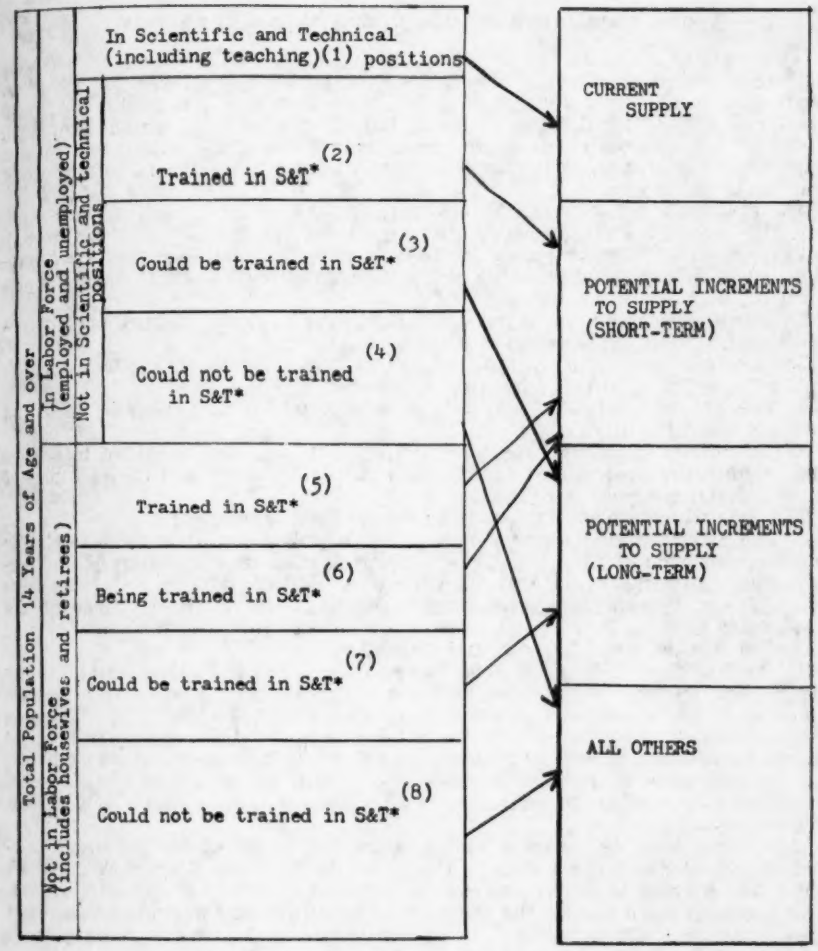
[8] The reference numbers refer to the groups shown in fig. 1.

FIGURE 1

SCHEMATIC DISTRIBUTION OF CURRENT AND POTENTIAL SCIENTIFIC AND TECHNICAL PERSONNEL IN THE POPULATION OF WORKING AGE


Total Population 14 Years of Age and over
In Labor Force (employed and unemployed)
Not in Labor Force (includes housewives and retirees)
Not in Scientific and Technical positions
In Scientific and Technical (including teaching)(1) positions
Trained in S&T* (2)
Could be trained in S&T* (3)
Could not be trained in S&T* (4)
Trained in S&T* (5)
Being trained in S&T* (6)
Could be trained in S&T* (7)
Could not be trained in S&T* (8)
CURRENT SUPPLY
POTENTIAL INCREMENTS TO SUPPLY (SHORT-TERM)
POTENTIAL INCREMENTS TO SUPPLY (LONG-TERM)
ALL OTHERS

*Scientific and technical positions

In terms of the scientific and technical personnel supply situation, then, these eight goups may be assembled as follows: The current supply consists of the first group; the second, fifth, and sixth groups together represent potential increments to the current supply within a relatively short time; the third and seventh groups represent potential long-term additions; and the fourth and eighth groups represent all other persons—the more unlikely candidates for addition to the supply.

SIZE, CHARACTERISTICS, AND UTILIZATIONS OF THE SUPPLY

The starting point in the quantitative appraisal of the supply of scientific and technical manpower is the number of persons, employed as scientists, engineers, technicians, and teachers of these personnel. A preliminary step should be that of identifying, defining, and classifying the positions they hold. However, information on the mere size of supply and of its various components, current and potential, is by itself insufficient to indicate the factors affecting the size of the supply.

Information is needed on the following:

1. The economic characteristics of the positions in which scientific and technical personnel are engaged, such as the industries in which employed, compensation levels, fringe benefits, occupational designations, the actual functions performed, and working conditions.
2. The demographic characteristics of persons in each category of supply—geographical location, sex, age, race, etc.
3. The educational and training characteristics of these persons, including the levels and types of formal education received.
4. The characteristics of aptitude and skill which they possess, including levels of mental ability.
5. Community characteristics—for example, the prestige accorded to science and engineering professions, their status within industry and the attitudes of various social groups toward them.

The data which are available may be summarized as follows:

1. The 1950 decennial census of population provided: labor force totals for engineers in each of nine categories; chemists, without a breakdown; and certain other categories of natural scientists. In addition, data on college teachers by field and certain categories of technicians were obtained. Some of the classes are broadly defined and many scientific and technical personnel may be classified elsewhere and hence be unidentifiable.
2. The National Register of Scientific and Technical Personnel maintained by the National Science Foundation provides data on a large number of scientists. These data are classified according to specific field of scientific specialization and 16 other characteristics. The Register, based on voluntary registration and drawn from scientific society rosters and other available lists, including annual Ph. D. recipients in science, remains incomplete for scientific and technical personnel as a whole. Nevertheless, it provides the largest single body of data on such personnel.
3. Surveys, such as "Science and Engineering in American Industry" (carried on by the Bureau of Labor Statistics for the National Science Foundation) and other surveys of particular groups engaged in research and development, have provided estimates of the numbers of scientists and engineers engaged in these activities. These surveys have been carried out primarily through mail questionnaires, supplemented to a degree by personal interviews.
4. The Bureau of Labor Statistics, with the cooperation of the Department of Defense, analyzed data from a 1949–50 roster of senior engineers compiled by the Engineers' Joint Council. Names were obtained through questionnaires mailed to engineering society members and individuals on available lists of nonmembers. Data were received from less than 15 percent of employed engineers as reported in the 1950 census.
5. Various surveys conducted by scientific societies, private commissions and Federal agencies of segments of particular groups of scientists and engineers tend to indicate the kinds of positions held by scientific personnel within these segments. However, the results are presented in general terms and pertain to limited samples of specialists in the given categories. Among the studies referred to are surveys of the members of the American Chemical Society and the Engineers Joint Council, followup surveys of recent college graduates made by the National Science Foundation and by the Women's Bureau, surveys by the

Commission on Human Resources and Advanced Training, surveys by the Bureau of Labor Statistics of "American Men of Science" and the National Science Foundation of persons included in the National Register.

Recommendations for obtaining data

1. *Identification of scientific and technical occupations (most urgent).*—Analysis of work content and job description in scientific and technical fields of interest to develop a set of detailed job definitions and classification, and to develop methods for identifying these occupational categories with adequate precision in surveys.

The intent of this basic recommendation is to provide a technical framework within which a statistical data program can be developed. It is concerned with identification of the functions associated with specialized personnel of various types, and the descriptions of these functions in terms which make standard classification, uniform data collection, and comparability possible.

Such analysis is neither a single time project nor one which must be completed before action on other recommendations is initiated. The explosive growth in scientific activities will require a continuing surveillance over the content of scientific occupations to maintain meaningful classifications. Furthermore, occupational descriptions will be continually sharpened as they are used in data collection.

2. *Pool of scientific and technical personnel.*—The surveys recommended are basic and would underlie and support a number of the recommendations that follow. The primary purpose would be to gain information on the numbers, occupation, compensation, and other economic and personal characteristics of scientific and technical personnel. They would also be utilized to derive various other data pertinent to the supply of and demand for such personnel, such as employment on defense-related activities. The time periods and intervals involved and the subjects included in the inquiries would depend upon budgetary and administrative as well as technical considerations. Two types of surveys are involved:

(*a*) A periodic survey, using appropriate sampling techniques, of organizations and agencies of all types which are employers of scientific and technical personnel (most urgent). Establishments surveyed would include:

1. Industrial and commercial firms, approached directly by mail questionnaire, by interviews in the field or both.
2. Government agencies, including military. Approach to Federal and some State agencies might be through central units of control such as Civil Service Commission.
3. Educational institutions. Data would presumably be collected through existing reporting channels.
4. Professional and scientific organizations, foundations, societies, research bureaus, and other nonprofit organizations. The approach would be similar to that to industrial firms.

(*b*) From time to time an intensive analysis would be made through personal interviews, of a sample of present and former scientific and technical personnel, obtaining information on their origins, attributes and movement into and out of the supply (urgent).

The social and economic characteristics and background data for these persons would be intensively studied. Life histories might in some cases be obtained in considerable detail. Care would be taken to note the principal factors that might have affected choices of study courses and ultimate occupations.

These analyses could be conducted most efficiently in separate segments, as indicated above, in accordance with the varying sampling procedures but overall responsibility for planning and for the consolidation of the results should be centralized.

3. *1960 census survey of college graduates, scientific, technical, and other specialized personnel (urgent).*—It would be a special direct survey of a large sample of persons recorded in the 1960 census enumeration as college graduates or as persons currently or last employed in scientific or technical positions, whether college graduates or not.

Through such a survey valuable data could be acquired economically and efficiently concerning the kinds of training received by scientific and technical personnel and their demographic, economic, and social characteristics. Considerable information could also be obtained concerning sources of potential increments to the supply.

The sample survey of all types of college graduates would be especially useful, since it would provide comparable data on such other highly trained groups as those in the social sciences, the humanities, other professions, business, and Government administration.

4. *Sample population survey (urgent)*.—An occasional survey similar to the Current Population Survey of the Bureau of the Census.

This survey would give a measure of the number, occupations, and skills of persons outside the current supply which could not be obtained by establishment-based survey methods. From such a survey it would be possible to estimate the number of unemployed members of the current supply, those employed outside their scientific and engineering specialities, and retirees and others outside of the labor force. It would provide source data for estimating both the current supply of scientific and technical personnel and potential increments to it. A check on the results of the sample population survey could be obtained by comparing size estimates with those obtained from recommended surveys (2) and (3).

Such a survey would necessarily have to include an unusually large sample of the population, especially if geographical or occupational breakdowns are desired. Some of the questions asked would presumably parallel those of the decennial census. It may not, therefore, be advisable to implement this recommendation until the analysis of data on scientific manpower from the 1960 census has been completed.

5. *Analysis of data from National Register of Scientific and Technical Personnel (urgent)*.—The purpose of the analysis of Register would be to obtain data on personal and economic characteristics of scientific personnel to determine age, levels of education, functions, type of employer, scientific specialization, income levels, etc.

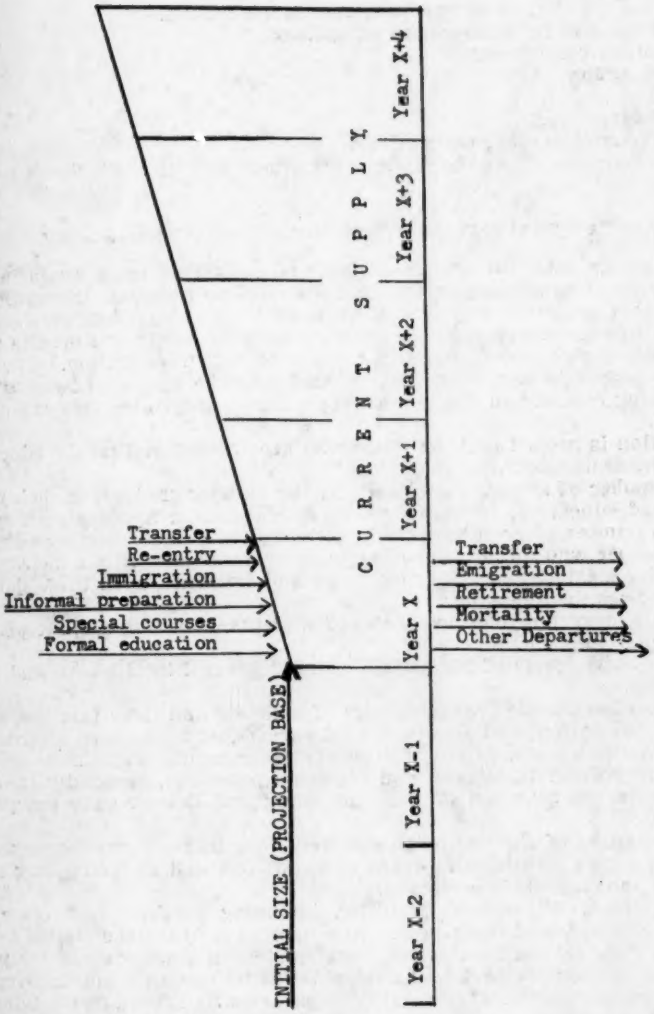
The Register now covers the major fields and disciplines of natural science. It represents a large potential source of information with data on some 150,000 registrants. As the Register is extended and coverage improved, it will become more representative of each field as well as providing information on a wider range of fields.

DETERMINANTS OF FUTURE SUPPLY: SOURCES OF INFLOW, CAUSES OF OUTFLOW, AND FACTORS AFFECTING THEM

The chief categories of inflow to and outflow from the supply of scientific and technical personnel, together with the resulting changes in size of the supply, are shown schematically in figure 2. This model is intended to show not only the processes by which supply is enlarged or diminished over time, but also the chief "metering points" at which statistical data could be obtained.

FIGURE 2

SCHEMATIC DIAGRAM OF CHANGE IN SIZE OF THE CURRENT SUPPLY OF SCIENTIFIC AND TECHNICAL PERSONNEL, INDICATING SOURCE OF INFLOW AND OUTFLOW



Estimates of the future size of the supply should be made by starting with its current volume, adding the estimated increments, and subtracting the estimated decrements. Hence the factors which determine the increments and decrements must first be stated. It appears that net change in any particular year will be determined by the combined effects of the following:

Inflow during the year from—

1. The formal educational system.
2. Special training courses and apprenticeship programs.
3. Informal training.
4. Immigration.
5. Reentry of retirees and others not in labor force.
6. Transfers from other occupations.

Outflow during the year from—

1. Mortality.
2. Retirement.
3. Emigration.
4. Transfer to other occupations.
5. Departures from the labor force other than through death or retirement.

INFLOW TO SUPPLY FROM THE FORMAL EDUCATIONAL SYSTEM

A surprisingly high percentage of persons classed as engineers attain that title by virtue of experience rather than full college training. Nevertheless, it is evident that the great majority of all scientific and technical personnel gain first entry through the formal educational system of public and private elementary schools, high schools, and institutions of higher education. The future size of the supply is to a large extent limited by the number of young people who are being retained in the flow through school and college toward ultimate graduation.

Information is needed both on those who are trained and on the educational system which trains them, for example:

1. The number of students enrolled and the number graduating each year, at each level of education, in each field of specialization, and for each type of school; the number of graduates who continue in school for further education; and the number who do not immediately enter vocations within their fields of educational specialization. Varying degrees of influence upon these data may be expected from the following:

   (*a*) Demographic characteristics of students, including age, race, sex, and geographic location.

   (*b*) Ability levels of students, including general intelligence and special aptitudes.

   (*c*) Socioeconomic characteristics of students and their families, such as income, education, and occupation of parents, and standard of living.

   (*d*) Attitudes and values of students, their families, and their communities with respect to science and scientific personnel, especially insofar as these influence selection of fields of study and the ultimate occupational choices.

   (*e*) Content of the education received, that is, the course exposure time and the actual breadth and depth of knowledge and understanding assimilated by the students in each field.

2. The Nation's educational facilities, including teachers and other staff, curricula, buildings, and equipment. Attempts to increase the Nation's supply of scientific and technical personnel must start with knowledge of the present and potential capacities of its educational institutions to produce them, both in numbers and in quality. Information is particularly needed on the following:

   (*a*) The teachers, their formal qualifications—courses and degrees—and their abilities.

   (*b*) Curricula of the educational institutions: the courses offered, the courses required for particular types of diplomas and degrees, and the actual content of these courses.

   (*c*) The physical facilities of the schools, including the buildings and the equipment, especially the laboratories and other facilities for teaching science.

   (*d*) The costs of education of various types, by whom they are borne, and the relationship of cost factors to student dropout rates.

The available data respecting the inflow to supply from formal educational institutions are, in general terms, as follows:

1. The Office of Education, in cooperation with State educational authorities, reports elementary and high school enrollment and number of high school graduates, by race and sex, according to State and size of city, or public schools only.

2. The Office of Education annually reports enrollment in each institution of higher education, degrees awarded by major field, and enrollment by field and class level in schools of engineering.

3. The Bureau of the Census reports, from the decennial census, the years of school completed and grade of school in which enrolled, by age, race, and sex, for each State. Annual reports from the current population survey are also made on school enrollment by race, sex, and type of school, in regions and the Nation as a whole.

4. A mail survey by the National Science Foundation was conducted in the summer of 1952, covering the employment at that time of a sample of June 1951 college graduates, by field of college specialization. Similar surveys were made by the Women's Bureau of women college graduates of June 1955 and June 1956. These surveys provide a partial indication of the extent to which the graduates entered the current or potential supply of scientific personnel.

5. The American Chemical Society periodically surveys the activities of new graduates in chemistry and chemical engineering. Some institutions, such as Stevens Institute of Technology, make periodic surveys of their alumni.

6. Studies were conducted by the Commission on Human Resources and Advanced Training into the relationship between intelligence quotient distribution and school retention rates, and between IQ and field of academic specialization. Similar studies have been conducted by other organizations.

7. Various studies and surveys have been made, especially by the Office of Education and the National Education Association, of the value of school facilities, new school construction, and the qualifications and characteristics of teachers.

8. For those included, the National Register of Scientific and Technical Personnel is a source of information on the education of scientists as well as their types of employment.

Recommendations for obtaining data

6.[4] *Extension of the coverage of school reporting, comparison of data from diverse sources, and other educational data (urgent).*—The purpose of the several projects recommended under this heading is to complete available information on the national educational systems.

(*a*) Extension of the annual and biennial statistical reporting program of the Office of Education: Such extension would include collection of data on private elementary and secondary schools, comparable to those now collected on public schools; data on the academic levels, fields, nature of support, and sex of students in institutions of higher education.

Information is also needed on the number of students taking science courses by type and length of course and by sex and other characteristics of student. Such data would indicate the number of students exposed to science courses at various levels and the relationship between such exposure and total course exposure.

(*b*) An intensive one-time statistical analysis to compare and coordinate Office of Education data on enrollments and graduates with Bureau of the Census data on enrollment and highest grade completed.

Present differences in data from these separate sources should so far as possible be eliminated or accounted for.

(*c*) Initiation of annual reports from the appropriate governmental agencies concerning technical schools operated by them, the character and extent of science instruction provided, and the utilization of personnel trained in science and engineering.

(*d*) Studies of the factors related to dropouts of students in various fields of different ability levels, at particular grades in school, seeking particularly to learn the effects of financial factors.

Data on extent and important of various economic aids to students, compared with needs for them, especially at the college level, would have much practical value. Information on aid funds and their availability to students could be collected rather easily from schools. A determination of the amount of

[4] Each recommendation is given an identification number in sequence.

financial assistance needed would require the development of formulas suited to the purpose and perhaps the addition of questions to an attitudinal or occupational preference survey.

7. Research into aptitudes in and attitudes toward science and engineering (urgent).—The purpose of the several related inquiries—some of them one-time some periodic—recommended under this heading is to provide insight into the factors that influence career choices. The inquiries recommended would cover the following:

(*a*) Research to determine the distribution of youth in terms of general mental ability and more specific aptitudes; and to relate these factors to demographic and social characteristics, especially to school dropout rates at the various levels, and to the students' major fields of study and occupational goals.

While some original studies of aptitudes may have to be undertaken to fill gaps in available information, for the most part this research might consist of the compilation, analysis, and correlation of results of many State and local student testing programs already in existence.

(*b*) Measurements of comprehension of scientific subject matter to which students have been exposed, through a series of tests at selected metering points.

Tests might be made, for example, at grades 6, 9, 12, fourth year of college, and last year of study at M.S. and Ph. D. levels. The standardized achievement tests and graduate record examination would be useful for this inquiry.

(*c*) Surveys of the attitudes of students at elementary, high school, college, and graduate school levels, concerning science and mathematics as subjects of study.

There may be particular significance in student reactions to particular types of teachers, teaching methods, textbooks, and presentations of materials at the time of early exposure to science and mathematics courses.

(*d*) Surveys of students' occupational conceptions and choices.

Answers would be sought to such questions as the following: What careers do students visualize for themselves? Why do they prefer certain fields to others? At what point do decisions about career selection become crystallized, especially in terms of general orientation toward or away from science and related fields?

The foregoing surveys would cover student values across a wide plane. For example, an examination of their attitudes toward and behavior in such areas as reading, logic and abstraction, intellectual discovery, service to and devotion to causes, self-discipline, group relationships, leisure, accumulation of wealth, etc. would throw light upon their present or potential scientific interests. In addition, a better understanding of the values which motivate them in such matters might suggest directions for public policy and action related to numerous current problems of or affecting youth.

(*e*) Surveys of samples of recent college graduates made 2, 4, and 6 years after graduation to learn the beginning career patterns of young graduates as these relate to their major fields of study and other personal characteristics.

(*f*) Studies of public attitudes toward science and engineering and the individuals who are employed in these fields.

8. Surveys of curriculums and physical facilities available for the teaching of science and engineering (urgent).—This recommendation involves several projects the purpose of which is to give insights into the level and efficiency of teaching in science and related subjects. Such projects might appropriately be undertaken at the instance of educational institutions and similar organizations.

(*a*) Periodic surveys of the courses offered in the science and engineering programs of schools and colleges: These surveys would involve the study of four separate matters: courses offered, courses required in each program, student exposure time by subject, and the actual quality and quantity of content of the courses. The first three items could be developed through compilation of data readily available in college catalogs and registrars' records; the fourth item would require intensive study of a representative sample of courses given.

(*b*) Periodic surveys to determine what laboratory and other equipment is used for the teaching of specific science and engineering courses in the Nation's schools and colleges. These findings should be related to accepted standards as to equipment requirements for the most effective teaching, as well as to actual physical facilities provided by leading educational institutions.

Pilot studies of the type now underway in Ossining, N.Y., may prove valuable. In that city a foundation grant has enabled the high school to expand its plant to provide a large, fully equipped, and staff science program. The purpose of this experiment is principally to determine whether a maximum provision of physical facilities has any effect on the intensity or character of student interest.

(*c*) Studies of the effectiveness of teachers of science, mathematics, and engineering, with consideration of the personal and impersonal factors involved.

The personality, teaching skills, and technical knowledge of teachers are often the chief determinants of student interests and occupational choices. Yet teachers who have not been adequately trained for the task—who have even prepared themselves to teach other subjects—may find themselves out of necessity in charge of courses in science or mathematics. Such possibilities are particularly great in elementary and secondary schools, where they are also particularly to be deplored. Data on both the formal training of teachers in science, mathematics, and engineering, and on the more personal characteristics related to their success or inadequacy as teachers, are needed. The first would include degrees held, course exposure in their own training period, and scientific and teaching experience. Such information in most cases could be obtained from the schools that employed them. Evidence of achievement and of mastery of the subject taught would probably require interviews with individual teachers and their supervisors.

INFLOW TO SUPPLY FROM SPECIAL TRAINING COURSES AND SOURCES OUTSIDE THE FORMAL EDUCATION SYSTEM

Scientific and technical personnel may be trained in formal courses of instruction other than those given in the regular schools and colleges. These may be courses taken in special trade and technicians' schools (including correspondence schools), schools operated by industrial firms for their own or their customers' employees, or schools operated by governmental agencies—Federal, State, and local. The category would include special schools operated by the armed services, other than the officer-training academies of the services, which are usually classified with civilian institutions of higher learning. Lower echelon technicians in science fields, in particular, may receive a large part of their training through apprenticeship programs.

Information is needed on the extent to which scientific and technical personnel receive training through formal programs outside the regular educational system.

The numbers of special schools for this purpose, the kinds of courses given, the quality of instruction, the numbers and characteristics of students, and the functions and capacities of persons who have been trained are insufficiently known for a conclusive appraisal of their relative importance to the supply of scientific and technical personnel.

No data of nationwide character on schools and programs of the type indicated was found in the course of this study. A study is currently being conducted by the Fund for the Advancement of Education upon the education programs conducted by major industrial companies.

Apprenticeship programs have been the subject of studies by the Department of Labor, labor unions, industrial organizations, and others. The great majority of these programs provide training to specialists who would not be considered scientists, engineers, or technicians. The research required to ascertain the role of apprenticeship in training scientific and technical personnel of various types and levels would have some similarity in its beginnings to the proposal in recommendation 1.

The establishment survey, recommendation 2a, and the interview survey of scientific and technical personnel, recommendation 2b, suggest possible means for obtaining information on the numbers and levels of employed scientists, engineers, and technicians who have been trained otherwise than through formal college and university instruction, and on the character and duration of such training. Such information might allow useful comparisons between the performance of those so trained and the performance of those whose training has been more formal.

The self-made scholar, poring over books by the light of a pine knot on the hearth, is a part of our Nation's pioneer legend. "Woodshed technologists" and their scientific discoveries and inventions are a part of the same tradition. It is impossible to say from sources known at present, but it may be important to learn, to what extent the supply of scientific personnel consists of entrants of this type.

To constitute a separate category of inflow their preparation must have been obtained neither in higher educational institutions nor within other formal educational programs such as those conducted by industry or the Armed Forces.

Recommendations for obtaining data

9. Surveys of training programs in science and engineering outside the formal education system (urgent).—The purpose of the projects listed under this heading is to complement the picture of the formal system of training in science and engineering.

(*a*) Sample surveys of industrial and commercial establishments to obtain information on formal courses within them and on apprenticeship programs for scientific and engineering technicians.

The scope of this survey may be determined in part by a prior study of the available literature on apprenticeship training programs with respect to scientific technicians.

(*b*) Occasional surveys of the formal, advanced scientific and technological training programs conducted by industrial and commercial establishments for their scientific personnel possessing college degrees or equivalent backgrounds.

(*c*) Identification of scientists and technicians who have received no formal training and the analysis by case studies of their background and the means through which their status was obtained.

If the survey of the pool of scientific and technical personnel, recommendation 2, discloses significant numbers who have not received formal training in their fields, case studies might produce useful leads toward methods of informal guidance or help in self-education that would contribute to the potential supply of scientific and technical personnel.

Changes in supply from immigration and emigration, retirement, death and other causes

The United States has received inestimable advantage from the immigration of scientists, engineers, and technicians who, after receiving education and in some cases considerable experience in their native or other foreign countries, have thrown in their lot with this Nation. The outflow from this country, in the form of permanent emigration of native Americans, appears to be negligible.

Little systematic information on these movements is available. Summary data in the 1950 U.S. Census of Population are given for the number of foreign born who were chemists, natural scientists not elsewhere classified, and technical engineers, the last in nine subcategories. A National Science Foundation bulletin[8] presents immigration data on professional workers for recent years.

Stories of immigrants, highly trained in their native countries, who had to accept menial positions in this country, indicate a malutilizaton of scentific manpower. The surveys proposed in several recommendations, by including questions on national origin of scientific and technical personnel, could produce a great deal of information on the training and other characteristics of the foreign-born who are now a part of the supply of this personnel, both current and potential. They would also throw light on the extent of malutilization referred to above. However, a continuing measure of the effect of immigration and emigration on changes in supply seems desirable.

Outflow from the current supply through retirement occurs for reasons of health, personal preference, employers' policies, or by some combination of these. Many firms and institutions require the retirement of employees at specified ages regardless of their mental and physical abilities. Others are more flexible in their policies and take into account the health of the employee and perhaps other considerations.

Information is needed on both the annual numbers of retirements of scientific and technical personnel and on factors, especially employers' policies, which affect them.

The available data appear to be limited to rough estimates of "disappearance rates." These are usually derived from comparisons of the numbers of scientists, engineers and technicians in specific age groups as reported in successive censuses.

An important aspect of the establishment survey, recommendation 2a, should be the assembly of information on employers' policies relating to retirement. Such information would not only be of value of itself but when combined with data on age distributions would permit more accurate estimates of retirement rates for personnel within the current supply. Such information might usefully be supplemented by questions on retirement plans in the interviews with scientific and technical personnel contemplated by recommendation 2b.

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[8] National Science Foundation, "Immigration of Professional Workers to the United States, 1953–56," NSF 58–4, February 1958, Washington, D.C.

The current supply of scientific and technical personnel may at any time, but especially in emergencies, also be augmented by retirees. A substantial number of retirees may be capable of working at least part time.

Information is needed on the numbers and characteristics of all those retired persons who would be able and willing, under given conditions, to return to full or partial employment in scientific and technical areas. No data on this subject are available.

Each year certain numbers of persons trained or experienced as scientists, engineers, technicians, or teachers of these fields, become managers, executives of salesmen, or take other positions, either for their present employers or for new ones. It is difficult to determine whether such changes of occupation lead to "malutilization" of skills or the extent of the loss from this source to the current supply of scientific and technical personnel. The analysis of work content and the job descriptions proposed in recommendation 1 are needed to determine whether new positions occupied by scientists or engineers in "management" or "sales" may not actually require high levels of scientific or technical competence. If this proves to be the case the apparent movement out of current supply of individual scientists, engineers, technicians, or teachers may not be as great as estimated.

Estimates of the outflow from the current supply due to changes in occupation can be made from information secured in the surveys suggested in recommendations 2 and 4. The interview survey (recommendation 2b) could include an intensive study of persons who had recently moved from scientific to other positions. This would reveal the special motivations and other factors leading to the job changes.

The sample population survey, recommendation 4, should disclose any substantial number of individuals who had left scientific or engineering fields for other occupations, but whose training would permit them to hold jobs in these fields. Questions could seek to ascertain the conditions under which those who would be eligible might return to the current supply of scientific and technical personnel.

There are undoubtedly persons other than retirees who, although presently outside the current supply of scientific and technical personnel, might under certain conditions be brought into it. Many persons with scientific or technical training occupy positions in which this training is not utilized. Many professionally trained women are now occupied with homemaking and child rearing but could return to the labor force. Other men and women may have left employment to remain idle.

Through the methods suggested in recommendations 3, 4, and 11 estimates could be obtained of the magnitude of the numbers involved. Repetitive surveys of the types proposed in recommendation 2 could show the movement out of the current supply due to those causes.

Loss through death to the active supply of scientific and technical personnel is probably less frequent than loss through retirement; nevertheless, death is numerically an important direct cause of loss to the current supply. Any reporting of deaths by occupation in mortality statistics is likely to have the defect of failing to differentiate between persons in the current supply and those who have retired. Thus the National Office of Vital Statistics, on the basis of data from the 1950 census and from death certificates for 1950, has made broad estimates of age-race-sex-specific mortality rates for occupational groups; but these apply to both retired and active workers. Further refinement of mortality rates for specific categories of scientific and technical personnel seems unlikely to disclose significant occupational differences; but this assumption should be checked. If it is well-founded, reasonably good estimates of losses to the current supply from mortality should become possible, provided only that the age distribution of the personnel currently employed be secured in the periodic establishment surveys proposed in recommendation 2a.

Recommendations for obtaining data

10. *Reports on immigration and emigration of scientific and technical personnel (urgent).*—Initiation of annual reports by the Immigration and Naturalization Service on the scientific and technical personnel of alien origin who immigrate into or emigrate from this country, and study of means for ascertaining the extent and character of the emigration of scientific and technical personnel reared and trained in this country.

The growing exchange of scientific information among countries and the need for better understanding of the scientific and technical manpower resources

of the free world add importance to this recommendation. Immigrants and emigrants should be classified in the reports by national origin and occupation as well as demographic characteristics. The suggested study of the problems of obtaining data on the emigration of native scientific and technical personnel might be entrusted jointly to the Immigration and Naturalization Service and the Passport Division of the Department of State, with assistance from other appropriate authorities.

11. *Interview survey of retirees (urgent).*—Special survey, to be repeated periodically, of a sample of retired scientific and technical personnel, designed to ascertain their ability and willingness to resume active employment full-time or part-time if needed.

In order to derive this sample it would be necessary to obtain lists of retirees as a part of the establishment survey, recommendation 2.

12. *Additional study of occupational mortality rates among scientific and technical personnel (urgent).*—A study of differential mortality among specific scientific and technical occupation groups.

This might employ a followup of death certificates available through the National Office of Vital Statistics and the results should be examined in connection with the periodic establishment survey suggested in recommendation 2a.

III. Demand

Information on the supply of scientific and technical personnel has little significance apart from data on demand. Demand and supply are interrelated. Following classical economic tradition they may be viewed as variables, with the two curves expressing them crossing at a point denoting price—in this case the salary levels. However, even classical economists would probably admit the importance of nonpecuniary factors affecting both variables. Moreover, on any short-term basis demand may be less stable than supply. Fluctuations of wide amplitude may occur with relativelpy great rapidity in demand without corresponding changes in supply. The development of scientific and technical personnel usually requires long period of training; nor can the supply of such personnel contract easily in adaptation to contractions of demand.

The statistical problems of estimating the magnitudes of supply and demand have many similarities. For both, current data are essential to provide bases from which to project estimates for future years.

THE CONCEPT OF DEMAND

The term "demand" is often used in common speech in a sense making it equivalent to unsatisfied requirement or desire. A concept both broader and more precise is essential for the purposes of this report. As here used the term will include both requirements that are being met and those which are not being met. It follows that present employment of scientific and technical personnel compromises a part of demand. The statistical picture needed for planning and policymaking requires this common component on both sides of the demand-supply equation.

At variance with some popular assumptions, it cannot be assumed that the demand for scientists, engineers, and technicians will be unlimited in the future. In any case, what has to be measured is effective demand. Effective demand

refers to the scientific and technical personnel that will be or could be employed at a given time under then-existing or attainable salary scales and working conditions.

From an operational standpoint demand may thus be regarded as the aggregate of three elements:

(*a*) Scientific and technical personnel currently employed as such;

(*b*) Established but unfilled positions requiring the skills of scientific and technical personnel;

(*c*) Needs for scientific and technical personnel not formalized in the establishment of positions but recognized by employers who are willing and potentially able to provide acceptable employment conditions.

Examples of the third and more amorphous of these three elements would be found among educational institutions, where recognized needs for additional science teachers may not as yet have led to formal budgetary provision for them.

A MODEL OF CHANGES IN DEMAND

The dimensions of demand and supply in the past and present are of primary interest to the National Science Foundation and the President's Committee on Scientists and Engineers. Statistical bases must be established for the projection of trends into the future.

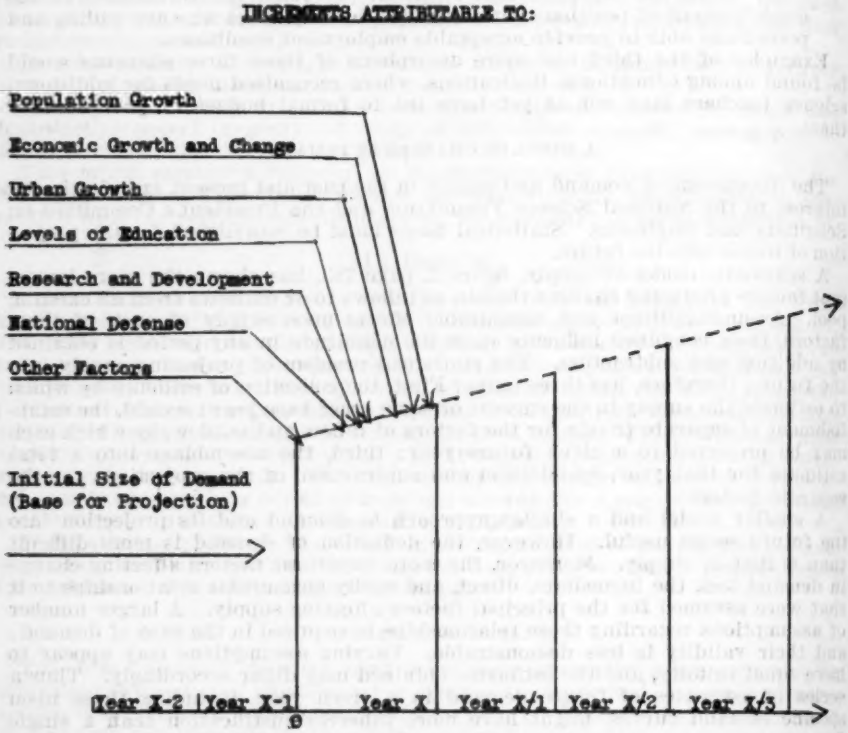
A schematic model of supply, figure 2, page 783, has shown the more important factors producing changes therein as inflows to or outflows from an existing pool. Assuming direct and measurable effects upon supply of each of these factors, their combined influence upon its magnitude in any period is obtained by addition and subtraction. The statistical problem of projecting supply into the future, therefore, has three parts: First, the collection of evidence by which to estimate the supply in the current or some other base year; second, the establishment of separate trends for the factors of inflow and outflow, by which each may be projected to a given future year; third, the assemblage into a total estimate for that year, by addition and subtraction, of the projections for the separate factors.

A similar model and a similar approach to demand and its projection into the future seems useful. However, the definition of demand is more difficult than is that of supply. Moreover, the more important factors affecting change in demand lack the immediate, direct, and easily measurable relationships to it that were assumed for the principal factors affecting supply. A larger number of assumptions regarding these relationships is required in the case of demand; and their validity is less demonstrable. Varying assumptions may appear to have equal validity, and the estimates obtained may differ accordingly. Thus a series of estimates of future demand in a given year, including those upon specific demand curves, might have more inherent justification than a single figure.

The schematic model presented in graphic form in figure 3 employs the hypothesis that the broad factors indicated have been chiefly responsible for long-term changes in demand for scientific personnel. Several of these factors might be termed "social forces"; and it should be noted that all of them have been identified by observers with growth and none with diminution of demand. This seems consistent with historical fact but does not imply the inevitability

FIGURE 3

SCHEMATIC DIAGRAM OF CHANGES IN MAGNITUDE OF DEMAND FOR SCIENTIFIC AND TECHNICAL PERSONNEL, INDICATING SOME PRINCIPAL FACTORS TO WHICH CHANGE MAY BE ATTRIBUTED.



of change in demand in a single direction only. Conceptually, other factors of similar breadth, or the factors appearing in figure 3 by reversal of their trends, might affect demand adversely rather than in the growth direction. It is not inconceivable, for example, that the population may decline.

As in our model of change in supply, figure 2, the model in figure 3 suggests that the total demand at a particular time is the net result of a number of determinants, whose separate effects are added to or subtracted from the volume estimated for a base period.

DETERMINANTS OF CHANGES IN DEMAND

Among the many broad determinants that could be specified within the hypothesis suggested above, those which follow seem to have major importance. They subsume many other, more specific factors. Some comment upon the availability of measures or indexes of each determinant will accompany each of the items listed.

1. *Population growth.*—Other things being equal, a growing population will require more goods and services, for the increased production of which more engineers, scientists, technicians, and teachers will be needed. The Bureau of the Census is the source for estimates and projections of population data.

2. *Economic growth and change.*—Both of these separable concepts are usually accompanied by corresponding activity in scientific and engineering fields, although economic growth is probably a more powerful factor in the economy. Growth is reflected by statistical series on national income, national product,

and other economic indicators. Economic change without growth as in the case of some structural change in the economy (or in the introduction of new styles or designs) is conceivable in a stabilized and static economy. However, change is not easily isolated from growth and for the purposes of analysis the two can best be considered as a single phenomenon and represented by the same statistical indicators.

3. *Growth in urbanism.*—A wide variety of cultural and social changes which increase or affect demands for scientific and technical personnel are associated with the functional specialization that accompanies urbanism. Pressures for transportation facilities, improved housing, schools, communication, and specialized forms of recreation are less pronounced in a rural population. However, these urban influences are being extended increasingly to rural life, with corresponding effect upon demands for the work of scientists, engineers, and technicians. Many current demographic and economic data provide evidence of the pervasive effects of urbanization. Indexes of urbanizing trends are to be found in census data on the distribution of population and in commercial data on newspaper and magazine circulation, radio and television coverage, etc.

4. *Levels, content, and quality of education.*—The general level of education reached by the population is positively correlated with personal income. The latter, in turn, is related to requirements for services and goods, and hence with the demand for scientific and technical personnel to be employed in supplying them. Changes in the content and quality of general education may also influence demand in a subtler fashion: A better education in the substance and methods of science and modern technology may induce in business leaders an appreciation of the advantages obtainable from the greater use of scientific and technical personnel in business enterprise.

Indexes of this determinant can be constructed from reports on enrollment, grade completion, and graduations by the Office of Education and the Bureau of the Census. Special studies of "exposure time" (to instruction in particular subjects) and other aspects of the content and quality of education in science prepared by the Office of Education, the National Education Association and others may also be utilized as indexes.

5. *Research and development.*—New scientific discoveries and technological inventions are a direct result of the work of scientific and technical personnel. At the same time they create a demand for more of such personnel to follow up the new avenues of research and development that have been disclosed. Expenditures for research and development by governmental agencies, business concerns, and educational institutions seem directly related to the demand for scientific and technical personnel. Data regarding such expenditures, if collected periodically over continuing periods, would provide useful series of indexes of these determinants.

6. *Requirements of national defense.*—Weapons development and the basic research underlying it are also directly related to demands for scientific and technical personnel. Less accessible to measurement are other requirements under this heading. They are varied and extensive because they involve the relations of the United States with other friendly powers as well as with potential enemies. They may include needs for training in science of foreign nationals in this country and the supply of weapons to allies. Despite the diversity of needs included within this determinant, the most satisfactory index of its impact upon demand is probably the annual appropriations by Congress for defense purposes.

In addition to the foregoing, numerous other determinants of demand for scientific and technical personnel can be identified conceptually, though in some cases their measurement presents difficulty. They are of varying degrees of importance and have been grouped together as a miscellany of other factors in figure 3. Among them are the following:

7. *The changing role of the United States in world affairs.*—One result of the vast changes during recent years in the relationships of nations has been a greatly increased demand for American scientists, engineers, and technicians to provide services in other lands. Federal programs of technical aid to underdeveloped areas represent an obvious example; but there are also many other ways in which American specialists, in the employ of private business, United Nations organizations, private foundations, foreign governments, and other agencies are serving abroad. Appropriations for technical assistance by the United States and the United Nations, together with personnel data of the International Cooperation Administration, may supply some part of the data needed to develop indications of trends in this area.

8. *Governmental policies.*—In addition to the determinants involved in governmental policy already named there are others in which legislative enactments or executive decisions may influence the demand for scientific and technical personnel. These decisions may involve, for example, new highway or other building programs, new health programs, development of atomic energy for peaceful purposes, and the like. Budget estimates or appropriations within such fields of expenditure may to some extent provide indexes of changes in demand due to this factor.

9. *Organizational structure of scientific activity.*—The changing organization of scientific and technological activity may be bringing new dimensions to society's demands for scientists and engineers. Examples are to be found in the growth of new organizations, some for profit and others not, designed to provide to clients research or other technical services which could not be as readily secured by direct employment or other means. A few crude indexes of this trend could perhaps be constructed from directories of business organizations or from lists of members of professional societies.

10. *Changing practices in utilization of scientific and technical personnel.*—Persons trained as scientists, engineers, and technicians seem increasingly in demand for managerial, administrative, and other functions such as technical selling, where their special knowledge is considered useful. This subject requires special study of the changing functions of scientific and technical personnel within business establishments and of the attitudes of management toward the value to them of science and technology, perhaps through a supplement to the Establishment Survey, recommendation 2a.

11. *The democratic value system.*—Demands for scientists, engineers, and technicians are probably to some extent determined by the attitudes of society toward them as individuals and by the social valuations placed upon their work and its products. Special studies to explore these attitudes and values have been suggested in recommendation 7.

CURRENT AND PROJECTED ESTIMATES OF DEMAND

Although some information exists about the present demand for scientific and technical personnel, there are few reliable estimates of demand in the future. The operational concept previously stated views demand as the aggregate (a) of persons already employed in the fields of science and engineering, (b) vacancies in established positions calling for scientific and technical personnel, and (c) needs for such personnel not formalized in the establishment of positions but recognized by potential employers.

The best information on the subject covers category (a) and consists of employment figures for certain groups of scientists, engineers, technicians, and teachers from the last national census and from various special surveys made by private associations and Federal agencies. However, these statistics, referred to in the chapter on "Supply," generally have the shortcomings of covering groups too broad to be very useful, of being very much out of date by this time, and/or of being based on highly inadequate samples.

Statistics on unmet demand, categories (b) and (c), to the extent that they exist at all, are even less adequate. They are restricted to some general estimates, based on insufficient data, of the outlook in several fields, and on certain surveys, limited in scope, of some employers' expression of their felt needs.

The purpose at hand—namely, the provision of a firm enough statistical base from which projections of demand in future years may safely be made—calls for separate and integrated approaches focused on demand alone. Three such integrated approaches are here suggested. It must be noted that none of these alone offers hope of obtaining estimates of a reliability equal to that obtainable for total supply. Taken together, and used as checks upon each other, confidence can be attached to results obtained in the ensemble.

1. *Segmental studies of demand.*—Since the employment of scientists, engineers, and technicians is highly concentrated in certain sectors of the economy, current demand and trends of demand may be usefully analyzed in the context of a number of varied industrial settings. This approach has the further advantage that particular types of scientific and technical personnel may be segregated and individually studied. Studies should be conducted in such a way that current estimates, as well as projections made from them, are additive.

2. *Correlation regressions among major determinants.*—The hypothetical determinants of change in demand included in the model set forth graphically in figure 3 should be tested for their actual significance as indicators. Methods of

partial and multiple correlation are available for such tests and suitable indexes of several of the determinants have been suggested above. A preliminary phase of the study would be a further examination of the most appropriate measures or indexes to employ in the correlations.

3. *Surveys of employers' expectations of demand.*—This third method involves the acquisition of direct information from the several categories of employers themselves, either in connection with the Establishment Survey, recommendation 2, or in close coordination with it.

Recommendation for obtaining data

13. *Periodic study of the demand outlook for various categories of scientific and technical personnel in each major activity (most urgent).*—Study would include the analysis of (a) employment and production growth trends, and (b) the changing roles of particular classes of scientific and technical personnel. The changing roles we have in mind would be indicated, for example, by trends in the ratios of scientists, engineers, and technicians in each occupation to total number of workers and by trends in the numbers and proportions performing various functions such as research, design, sales, testing, etc.

For the purpose of such segmental studies the quantitative data obtained through the Establishment Survey (recommendation 2a) should be supplemented by selective interviews in each activity to ascertain the nature of factors affecting the employment of each type of worker, the prevailing practices for the utilization of this personnel, the place of scientific and technical personnel within the organizational structure of the activity, and similar matters.

Analysis of the demand outlook in each activity requires the usual techniques of economic projection, the development of economic models for future years, and the projection of activity in each industry by analysis of its relation to the relevant components of the model. In this manner consistent projections can be made for all activities.

The segmental approach permits such special factors as the Federal highway program, defense production programs, and school construction programs to be taken into account by their specific inclusion in models at appropriate points. Thus, the effect of the highway program on the construction industry (and resultant employment of civil engineers) and on the construction materials and equipment industries (and resultant employment of chemists, mechanical engineers, etc.) could be specifically estimated.

14. *Correlation regressions among major determinants of demand for scientific and technical personnel (urgent).*—Historical studies of the regression relationships between demand series and the several factors hypothesized to be major determinants of demand with a view to determining the degree of predictive significance which each of them may possess.

It is possible that the retrospective studies recommended would disclose a high predictive value for some factors, singly or in combination, for estimating subsequent demands for scientific personnel. From practical operating standpoints it would probably be necessary for the series representing demand to reflect only the first of the three elements in the demand concept, namely, the scientific and technical personnel who in each time period were currently employed as such.

15. *Surveys of employers' expectations of demand for scientific and technical personnel (urgent).*—Periodic organization of surveys of the expectations of present and potential employers of scientific and technical personnel as to the numbers and types of such personnel they will need at specified times in the future and of the major factors that according to the employers will determine their future needs.

It may be feasible through this method to derive useful estimates of future demand for periods as long as several years. However, estimates covering shorter periods are likely to be more satisfactory. Estimates of need projected for 6 months to 1 year should be reasonably accurate, since many such estimates will be based upon contracts already let and programs already set in motion.

IV. Summary

In parts II and III a program was evolved in detail for completing available national information on scientific and technical personnel. This program was presented in the form of 15 separate projects many of which could be subdivided further into several different studies and surveys. Each of the projects is expected to provide important information needed for policy formulation on scientific

manpower. Taken together and in conjunction with the data already available, the projects are expected to provide a reasonably complete picture of the Nation's resources and requirements, present and future, in the area of scientific and technical manpower.

In development of this program strict adherence to the terms of reference was sought by confining attention to the problems of scientific manpower and among them to the questions of practical interest for policy formulation. This does not mean that we are unaware of the broader issues involved in the use of trained manpower or the need for research on a broader basis.

All 15 projects are recommended for early implementation, but obviously some are more urgent than others. Accordingly, priorities were established and were indicated with the recommendations in the text of the report. Three recommendations were considered "most urgent" since they constitute the cornerstones of a solidly built program for obtaining national information concerning scientific and technical personnel. With respect to the timing of implementation of the studies recommended, it was realized that this would come about through integration of these suggestions into existing statistical programs, through initiation, where necessary, of new programs and through improvements in methodology, specificity, and coverage.

As noted, some of these projects mean the extension and elaboration of existing programs of statistical reporting and analysis. Others require the initiation of new surveys or of research into new fields. The surveys would have to be conducted through establishments or would be direct population surveys. This classification should be useful in the planning and organization of the program and is given below:

Extensions of existing programs of data collection and analysis:

5. Analysis of Data From National Register of Scientific and Technical Personnel [6]
6a. Extension of School Reporting [6]
6b. Comparison of Data From Diverse Sources [6]
8a. Surveys of Curricula in Science and Engineering [6]
8b. Survey of Physical Facilities for the Teaching of Science [6]
8c. Studies of Effectiveness of Teachers of Science, Mathematics, and Engineering [6]
10. Reports on Immigration and Emigration of Scientific and Technical Personnel [6]
12. Additional Study of Occupational Mortality Rates Among Scientific and Technical Personnel [6]
13. Periodic Study of the Demand Outlook for Various Categories of Scientific and Technical Personnel in Each Major Activity [7]

New surveys conducted through establishments:

1. Identification of Scientific and Technical Occupations [7]
2. Pool of Scientific and Technical Personnel [7]
6c. Reports of Government Technical Schools [6]
9a. Study of Training Programs for Scientific and Engineering Technicians in Industrial and Commercial Establishments [6]
9b. Surveys of Advanced Scientific Training Programs of Industrial and Commercial Establishments [6]
9c. Survey of Background of Scientific and Technical Personnel Who Have Had No Formal Training [6]
11. Interview Survey of Retirees [6]
15. Surveys of Employers' Expectations of Demand for Scientific and Technical Personnel [6]

New surveys of population:

3. 1960 Census Survey of College Graduates and of Scientific Technical and Other Specialized Personnel [6]
4. Sample Population Survey [6]
7e. Follow-up Surveys of Recent College Graduates [6]

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[6] Urgent.
[7] Most urgent.

New research in special problem areas:

6d. Analysis of Factors in School Retention [6]

7a,b,c, and d. Research into Youth's Aptitudes in and Attitudes Toward Science and Engineering [6]

7f. Research into Community Attitudes Toward Scientific and Technical Personnel [6]

14. Correlation Regressions Among Major Determinants of Demand for Scientific and Technical Personnel [6]

The program will require genuine cooperation from Federal, State, and local government agencies and from private organizations. The sincerity with which this cooperation is extended is particularly important, since it must be emphasized that the prompt and thorough implementation of the program and the economic use of funds and research facilities require some centralization of responsibility. An appropriate Federal agency should be given explicit responsibility for coordinating that part of the work which involves Federal Government support, for analyzing and synthesizing the data produced, and for making the findings promptly available to action agencies, public and private, as well as to the American people.

LEGISLATIVE HISTORY OF THE NATIONAL REGISTER, 1945–50

Allen O. Gamble, Register Project Director, February 1958

The two provisions of the National Science Foundation Act of 1950 which relate to and provide the basis for the national register of scientific and technical personnel are as follows:

"SEC. 3. (a) The Foundation is authorized and directed—

"(8) To maintain a register of scientific and technical personnel and in other ways provide a central clearinghouse for information concerning all scientific and technical personnel in the United States, including its Territories and possessions.

"SEC. 14. (i) The National Roster of Scientific and Specialized Personnel shall be transferred from the United States Employment Service to the Foundation, together with such records and property as have been utilized or are available for use in the administration of such roster as may be determined by the President. The transfer provided for in this subsection shall take effect at such time or times as the President shall direct." [1]

The following is a complete chronological recital of the legislative history of these two provisions of the act of 1950. It quotes in full all references to the Register found in available documents, including 448 pages of the Congressional Record, 7 reports issued by Senate and House committees, and dozens of bills.

Briefly stated, the record shows that a register provision was included in the very first bill to bear the title "National Science Foundation Act" introduced in December 1945. This first provision was substantially the same as that which became law in 1950, there being only four differences, two minor and two significant. Furthermore, the register provision appeared in every one of the dozens of Foundation bills, without exception in both Senate and House, throughout the entire 5 years of the turbulent history of the effort to pass a National Science Foundation Act. The same is true of the provision for transfer of the national roster to the Foundation, except that this provision appeared originally in the second bill rather than the first.

There were many references to the register throughout the 5 years, all favorable except for a challenge in 1950. But even here the challenge, which was brief and unsuccessful, was directed at who should maintain the register rather than against the concept of maintaining it.

1. Origin of register provisions in 1945 and 1946

The first bill to bear the title "National Science Foundation Act" was S. 1720, introduced by Senator Kilgore on December 21, 1945, during the last days of the 79th Congress, 1st session.[2] This bill included the following:

"SEC. 7. The Administrator shall maintain a register of scientific and technical personnel and in other ways provide a central clearinghouse for infor-

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[1] Public Law 507, ch. 171, 81st Cong., 2d sess. (S. 247), approved May 10, 1950.

[2] This bill and others referred to in following paragraphs are available in a volume in the Foundation library.

mation concerning all scientific and technical personnel in the United States and its possessions. No individual shall be listed in such register without his consent."

This was the first provision for a Foundation register to appear in any bill. It will be noted that the basic wording is virtually identical with that included 5 years later in the act of 1950. There are only four differences: (1) The original "The Administrator shall maintain" later became "The Foundation is authorized and directed to maintain"; (2) "in the United States and its possessions" became "in the United States, including its Territories and possessions"; (3) the second sentence, "No individual shall be listed in such register without his consent," was deleted; and (4) the register section, which in 1945 was paired with the section on scholarships and fellowships in about the middle of the bill, was moved up in the act of 1950 to a place in section 3 among the eight basic functions of the Foundation.

Two months later, on February 21, 1946, in the 79th Congress, 2d session, Senator Kilgore introduced a new and somewhat revised bill, S. 1850. This included precisely the same section 7 providing for a register. It also contained a provision for transfer of the old national roster to the Foundation. The provision, which appeared for the first time in this bill, read as follows:

"SEC. 11(e) * * * The National Roster of Scientific and Specialized Personnel shall be transferred from the Department of Labor to the Foundation, together with such of the personnel, records, property, and balances of appropriations as have been utilized or are available for use in the administration of such roster as may be determined by the President. The transfers provided for in this subsection shall take effect at such time or times as the President shall direct."

There are only two differences between this original provision and section 14(i) of the act of 1950: (1) "from the Department of Labor" was changed to "from the U.S. Employment Service" because in 1950 the USES was being transferred from the Federal Security Agency back to the Department of Labor; and (2) "such of the personnel, records, property, and balances of appropriations" was changed to "such records and property" because by 1950 the roster had neither personnel nor balances of appropriations to be transferred.

The Senate committee report on S. 1850 contains the first substantive congressional comment concerning the register:

"The experience of war agencies has demonstrated the importance of placement facilities for scientific personnel. The success and usefulness of the national roster of scientific and specialized personnel and of the Office of Scientific Personnel suggest that the Foundation should maintain an up-to-date register of trained personnel which would be particularly useful—

"(1) In meeting the personnel needs of its own programs.

"(2) In placing the scientific personnel trained through the Foundation's programs of scholarships and fellowships.

"(3) In selecting scientific personnel to meet the Nation's need in time of war or other national emergency.[3]

On the Senate floor there was much discussion of S. 1850 on July 1, 2, and 3 and many of its features were debated vigorously, but there was no objection to or discussion of the register provisions. On July 3 the bill was passed by the Senate.

In the House of Representatives the first bill introduced was H.R. 6448 by Congressman Mills of Arkansas. Also introduced was H.R. 6672 by Congressman Celler. Each included precisely the same wording as S. 1850 concerning the register. But there was no House committee report and no floor comment on the register provisions. The House did not pass either of these bills "because the pressure of legislative business at the close of the session was such that the House adjourned before it could take action."[4]

2. Passage and veto in 1947

During the 80th Congress, 1st session, two competing bills were introduced in the Senate on February 7, 1947, S. 525 by Senator Thomas and S. 526 by Senator Smith. Each contained precisely the same register provisions as in S. 1720 of 1945 and S. 1850 of 1946 quoted above. The Senate committee re-

[3] S. Rept. 1136, 79th Cong., 2d sess., Apr. 9, 1946, p. 36. Also given in Congressional Record, Senate, July 1, 1946, p. 8152, 2d col.

[4] Quoted from Senator Magnuson, Congressional Record, Senate, May 15, 1947, p. 5460, 2d col.

ported favorably on S. 526 and made the following comment concerning the register in its report:

"In order to maintain a record, in case of future need, of scientific and technical personnel, and in order to assure the optimum utilization of such personnel, the Foundation is to maintain a register of such men and to act as a central clearing-house for information concerning them. No charges of regimentation can validly be made, since the bill expressly provides that no individual shall be listed in this register without his consent." [5]

During the discussion of S. 526 on the Senate floor the following exchange took place:

"Mr. MAGNUSON. I notice one provision on page 11 which I think should be explained. I refer to the language in line 3, in which we say, 'No individual shall be listed in such register without his consent.'

"I ask the Senator from New Jersey whether that means the Foundation will maintain a register of scientific and technical personnel of all types, including those who have fellowships and scholarships.

"Mr. SMITH. That is my understanding.

"Mr. MAGNUSON. Therefore the restriction that no individual shall be listed in such register without his consent means that no scientifically inclined person need participate unless he wishes to do so.

"Mr. SMITH. I think that is the correct explanation.

"Mr. MAGNUSON. Undoubtedly most of those who receive scholarships or fellowships would be listed anyway, with or without their consent.

"Mr. SMITH. I think they would be listed automatically. Probably they would want to be listed." [6]

After 5 days of debate the Senate passed S. 526, the vote being 79 to 8 with 8 not voting. As passed, the bill contained the register provisions, without change and without comment other than quoted above.

In the meantime on February 10, 1947, three bills identical with S. 526 had been introduced in the House, H.R. 1815 by Congressman Case, H.R. 1830 by Congressman Mills, and H.R. 1834 by Congressman Priest, and on February 18 a fourth was introduced by Congressman Hays, H.R. 2027. An earlier bill, H.R. 942, was also considered. The bill finally reported out by the House committee on July 10, 1947, was H.R. 4102, introduced by Congressman Wolverton of New Jersey. This bill contained the same wording providing for a register, in section 10(b). The only comment concerning this section in the House committee report was as follows:

"By subsection (b) the Foundation is directed to maintain a register of scientific and technical personnel, but no individual may be listed in such register without his consent." [7]

The bill was discussed in detail on the House floor on July 16, but without reference to the register, and passed on the same day.

On July 21 the Senate-House conference report was placed in the House portion of the Congressional Record, followed by no comment from the floor. The conferees had agreed to virtually all of the provisions of H.R. 4102 as a substitution for S. 526. This bill included section 10(b) providing for a register, without change in wording.[8] It also included without change the section 16(k) providing for transfer of the national roster to the Foundation.[9]

On July 22 the same joint conference report was placed in the Senate portion of the Congressional Record, followed by extensive comment from the floor. The Senate finally agreed to the conference report [10] and the bill was sent to the President.

On August 6, 1947, President Truman pocket-vetoed the bill for several reasons, the principal one being that a Board of part-time officials would be given control, including selection of the Director, which would prevent the President from effective exercise of his constitutional duty of controlling the execution of the law. He did this with regret, being otherwise in favor of the bill. This Presidential message made no reference to the register provisions.[11]

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[5] S. Rept. 78, 80th Cong., 1st sess., Mar. 26, 1947, p. 6.
[6] Congressional Record, Senate, May 15, 1947, p. 5467, 1st col.
[7] H. Rept. 864, 80th Cong., 1st sess., July 10, 1947, p. 7.
[8] Congressional Record, House, July 21, 1947, p. 9791, 1st col.
[9] Ibid., p. 9792.
[10] Congressional Record, Senate, July 22, 1947, p. 9850, 1st col.
[11] Congressional Record, appendix, Aug. 15, 1947, pp. A4442, A4443.

3. Reports and discussion in 1948; deletion of "without consent" clause

During the 80th Congress, 2d session the only event of interest with respect to the register was the dropping of the last sentence in the provision which had remained unchanged since 1945: "No individual shall be listed in such register without his consent." The revised section then read as follows:

"The Foundation shall maintain a register of scientific and technical personnel and in other ways provide a central clearinghouse for information covering all scientific and technical personnel in the United States and its possessions."

The one-sentence provision was included in S. 2385, which was introduced on March 25, 1948, by Senator Smith jointly with seven other Senators. This bill was reported favorably by a Senate committee on April 20, the report containing the following minimum reference to the register: "A roster of scientific personnel is to be maintained." [12] An equally brief mention of the transfer of the National Roster to the Foundation was made on page 5 of the same report. The Senate discussed this bill intensively on May 3, 4, and 5; made some amendments (none affecting the register); and passed it by voice vote on May 5, 1948.[13]

In the meantime Congressman Priest had introduced H.R. 4852 on January 6, containing the same one-sentence provision for a register and the usual provision for transfer of the National Roster. On March 25 Congressman Wolverton introduced H.R. 6007 which was reported June 4, accompanied by House Report No. 2223, including these register provisions. This bill failed to reach the House floor, so no legislation reached the President.

4. Bills and reports in 1949; increased status for the register

Senator Thomas introduced S. 247 on January 6, 1949, jointly with six other Senators (Kilgore, Fulbright, Magnuson, Smith, Cordon, Saltonstall). It included the one-sentence register provision and the usual provision for transfer of the roster to the Foundation. On March 3 a favorable report was submitted, including minimum reference to the register section: "A roster of scientific personnel is to be maintained." [14] A similar minimum mention of transfer of the roster was made on page 7.

In the House seven bills were introduced. Four (H.R. 12, 185, 311, and 2751) were identical with the H.R. 6007 which had been favorably reported the preceding year. Two (H.R. 1845 and 2308) were identical with S. 247 mentioned in the preceding paragraph. One (H.R. 359) differed substantially from all the others, incorporating provisions rejected in previous years.[15] The first six of these bills included the one-sentence provision for maintaining a register, and the usual provision for transfer of the roster. H.R. 359, however, reverted to 1947 by including the sentence, "No individual shall be listed in such register without his consent."

The House committee reviewed these seven bills and all the testimony of the preceding 4 years, then drafted a new bill, H.R. 4846, which was introduced by Congressman Priest on May 24, 1949. "The committee believes that H.R. 4846, as amended, is a better bill with respect to form, as well as content, than any bill on the subject heretofore proposed, and that it meets the objections expressed by the President in his (veto) memorandum of August 6, 1947, with respect to S. 526." [16]

With respect to the register, a significant change had indeed been made, clearly increasing its status. Up to this point the provision for maintenance of a register had been, since 1945, invariably linked to the section or subsection concerning scholarships and fellowships, and located (usually as about section 9 or 10) about midway in the bill. Now the register was moved up to section 3, following only the enacting clause and the establishment clause, and was made one of the eight basic functions of the Foundation. Two slight changes in wording were concurrently made: (*a*) instead of "The Foundation shall maintain a register * * *" the mandate was changed to read "The Foundation is authorized and directed—to maintain a register * * *"; and (*b*) instead of "* * * in the United States and its possessions." the wording was changed to "* * * in the United States, including its Territories and possessions."

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[12] S. Rept. 1151, Apr. 20, 1948, p. 4.
[13] Congressional Record, Senate, May 5, 1948, p. 5435, 3d col. For the register provision see p. 5436, 3d col., and for the Roster transfer provision see p. 5437, 3d col.
[14] S. Rept. 90, 81st Cong., 1st sess., Mar. 3, 1949, p. 6.
[15] H. Rept. 796, 81st Cong., 1st sess., June 14, 1949, pp. 5, 6.
[16] Ibid., p. 6.

The House report on H.R. 4846 mentioned the register provision and the Roster-transfer by simply repeating their wording in the bill.[17] However, the report includes many letters of comment from Federal departments and agencies, two of which relate in part to the register. One was from the Secretary of Labor whose letter dated March 29, 1949, stated:

"The maintenance of such a roster is a very important function, and I believe that it properly belongs in the National Science Foundation. Since, however, a close working relationship should be established between the Foundation and the U.S. Employment Service in order to utilize the nationwide facilities of the Service for locating employment opportunities for scientifically trained personnel and for bringing properly qualified personnel to employers, consideration may be given to indicating in the bill the desirability of establishing such a relationship." [18]

Also the Director of Bureau of the Budget, under date of May 5, 1949, suggested that in the Roster-transfer section, "U.S. Employment Service" be substituted for "Department of Labor" and then made this comment:

"The attention of the committee is invited to the fact that a postwar roster of scientific personnel has been established by the Office of Naval Research; it is intended that this roster would be transferred to the Foundation by administrative action upon its establishment." [19]

Neither the House bill nor the Senate bill reached the floors of Congress during 1949, so no National Science Foundation legislation was passed that year, but H.R. 4846 had laid the basis for successful enactment the following year.

5. The register is challenged

The Senate had passed S. 247 on March 18, 1949, during the first session of the 81st Congress and allowed it to stand during the early part of the second session while the House considered similar legislation. During this second session in 1950 nearly all of the floor discussion was in the House. More was said concerning the National Register than during all of the preceding congressional discussions.

House bill H.R. 4846 had been developed by committee and reported upon in June 1949 (Rept. No. 796) but without floor discussion. On February 27, 1950, H.R. 4846 was opened for debate. The register was mentioned favorably but briefly by Congressman Wolverton of New Jersey, Congressmen Priest of Tennessee, Biemiller of Wisconsin, and Wilson of Oklahoma. Congressman Wilson said:

"The National Science Foundation will not only provide us with the means to educate the most talented of our youth but it will retain a register of the scientific personnel of the Nation for use in times of war or national emergency and as a clearinghouse for the full utilization of the creative potential of this group." [20]

On the same day, for the first time since such a provision was introduced in 1945, a substantive objection concerning the register was raised. This objection was raised by Congressman Wadsworth of New York:

"Mr. WADSWORTH. Another thing—they are authorized to maintain a register of scientific and technical personnel and to provide a central clearinghouse for information covering all scientific and technical personnel in the United States.

"I may remind the members of the committee that that is already being done by the National Academy of Sciences.

"Back in 1863, in the administration of Abraham Lincoln, the Congress incorporated, under a charter granted to the organization, the National Academy of Sciences. It was not incorporated as a part of governmental machinery. It is outside the Government as contrasted with this Foundation which is to be inside the Government, and a part of Government operation.

"The National Academy of Sciences, under its charter, is required to respond to the request of any department of the Government of the United States for aid and assistance in conducting scientific research. When so requested, and they must respond, they do so without any thought of gaining a profit. In order to keep the Government informed as to what men in the United States are the better able to engage in these research problems, the National Academy of Sciences maintains a list of the eligible scientists that the Government may

[17] Ibid., pp. 10, 16.
[18] Ibid., pp. 29–30.
[19] Ibid., p. 41.
[20] Congressional Record, House, Feb. 27, 1950, p. 2433, 2d col.

call upon at any moment. There is not the slightest necessity for this Foundation maintaining another list." [21]

On March 1, 1950, Congressman Wadsworth followed up his earlier objection with a proposed amendment which was opposed by Congressman Heselton of Massachusetts:

"Mr. WADSWORTH. Mr. Chairman, I offer an amendment.

"The Clerk read as follows:

"'Amendment offered by Mr. Wadsworth: On page 3, strike out lines 15 to 19, inclusive.'

"Mr. WADSWORTH. Mr. Chairman, this paragraph authorizes the Foundation to maintain a register of scientific and technical personnel and in other ways provide a central clearinghouse for information covering all scientific and technical personnel in the United States.

"Mr. Chairman, this is the very thing that the National Academy of Sciences has been doing since 1863. One of the duties imposed upon the National Academy of Sciences in its charter, which was granted in 1863, is to respond to requests of any department of Government to furnish to that department scientific assistance and the names of the scientists who may be of assistance to the Government. They have kept that up for years and years.

"It should be remembered that the National Academy of Sciences is not an arm of the Government. When they make up a list of available scientists no influence of Government is felt. To my mind, there is an exceedingly important difference between the present custom under the National Academy of Sciences and the one proposed here, because this National Science Foundation is to be and arm and part of the Government itself and, clothed with that power, the National Science Foundation can make up its own list of eligible scientists and that will become the Government's list.

"That, I think, Mr. Chairman, is a power which should not be placed in the hands of a governmental authority. It should be left in the hands of the National Academy of Sciences, which is not a branch or arm of the Government but is an independent organization unswayed by politics or governmental policies.

"It is for that reason that I move to strike out that paragraph and allow the present machinery to work as it has been working for years.

"Mr. HESELTON. Mr. Chairman, I rise in opposition to the amendment.

"Again, Mr. Chairman, let me say that I have the deepest regard and highest respect for the gentleman who has offered this amendment. It so happens that within the hour I have had a telephone conversation with Dr. Merriam E. Trytten, who is director of the office of scientific personnel, National Research Council. He asked me if I would explain to the Members the situation that exists now.

"It is a fact that from 1863, when they initiated this effort, they did a pretty good job, but he told me that approximately 3 years ago because of lack of funds and lack of personnel they had to limit themselves to maintaining a register only from the Ph. D. level upward, that that is entirely unsatisfactory, and that they have no information about the existence or qualifications of our younger scientists, who are the ones that we are, after all, trying to locate and assist.

"He asked me to say to you that the Council not only does not oppose this provision, but that it hopes it will be kept in this bill. He says we will then have a working list which will be available not only to the Government but to industry, to private research institutions, as well as to our universities and colleges. I assure you that I believe he is giving us excellent advice.

"I wish he had called the gentleman from New York. I can assure the gentleman I am giving the exact message that he gave to us. I hope you maintain this list for our own security.

"Mr. FULTON. Mr. Chairman, will the gentleman yield?

"Mr. HESELTON. I am glad to yield to the gentleman.

"Mr. FULTON. In establishing this list and by being left off of it, will it more or less be a blacklisting of any individual or would it have any effect on his standing in the scientific community?

"Mr. HESELTON. I do not understand there has been any occasion in the past where that has happened while it was in active use. I cannot conceive that any scientist who is qualified would be omitted from this list. The purpose of the listing is so that those who wish to get in touch with qualified scientists will know where they are and will be able to reach them. That is the only purpose." [22]

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[21] Ibid., p. 2415, 2d col.
[22] Ibid., Mar. 1, 1950, p. 2592, cols. 1, 2, and 3.

After an interruption on another matter, Congressman Biemiller, of Wisconsin, also defended the register, and the amendment was rejected:

"Mr. BIEMILLER. Mr. Chairman, I wish to speak briefly for the committee members on this side of the aisle in opposition to the amendment offered by the gentleman from New York [Mr. Wadsworth]. We agree heartily with the expressions of the distinguished gentleman from Massachusetts [Mr. Heselton]. We believe he has brought important information to the committee in regard to the attitude of the National Academy of Sciences on the maintenance of an official scientific roster.

"In addition to that, we would like to call attention to the fact that there is already in existence a Government roster of scientific personnel, a roster that was started during the war by OSRD and is now being continued by the United States Employment Service, which is a part of the Department of Labor.

"Section (1) on page 19 transfer that roster from the Department of Labor to the National Science Foundation. I think that an eminently desirable provision. We hope it will prevail and that the power granted the National Science Foundation on page 3 will be continued.

"Mr. WADSWORTH. Mr. Chairman, will the gentleman yield?

"Mr. BIEMILLER. I yield.

"Mr. WADSWORTH. I may say to the gentleman it is a surprise to me to hear the announcement that the National Academy of Sciences cannot afford to do this work. I had heard to the contrary from other members of that organization. But assuming that that statement is correct, and the National Academy of Sciences has not enough money to supply a complete list, would it not be within the power of this proposed Foundation to give it a little money and to still keep the formation of this list out of Government hands?

"Mr. BIEMILLER. I would assume that the National Science Foundation, which will have on its board of directors eminent scientists from all parts of the country, would certainly want to cooperate in every reasonable, feasible manner with the National Academy of Sciences. I think such will be the case. But I repeat, as I said a moment ago, there is already in existence a Government roster. It is very desirable that that roster be transferred to the National Science Foundation and that the National Science Foundation use its judgment in maintaining the proper roster in the future, to make sure that the United States has a complete catalog of available scientific personnel in the country.

"Mr. Chairman, I yield back the remainder of my time.

"The CHAIRMAN. The question is on the amendment offered by the gentleman from New York (Mr. Wadsworth).

"The question was taken; and on a division (demanded by Mr. Jennings) there were—ayes 44, noes 66.

"So the amendment was rejected." [23]

On the same day H.R. 4846 was passed, 247 to 126.[24] It contained without change the provisions for a register and for transfer of the national roster to the Foundation.

Incidentally, on February 28, Congressman Priest, of Tennessee, chairman of the House committee which developed the bill, made a comment concerning another matter which has an indirect bearing on the Register:

"Let me make this statement. Suppose, for instance, we were at war, or suppose that war was very imminent, and it is necessary in this Nation to utilize every possible scientific research organization in the country. I feel it should be possible under a situation such as that for the Secretary of Defense, if he so desires, to request the National Science Foundation to engage in certain research and that certainly there should be authority in the act for it to do so without splitting hairs as to whether that research is basic or whether it is not basic, if the security and the safety of the Nation may be at stake and the Secretary of Defense wants it and the Foundation is able and willing to do it. We purposely left out "basic" in this paragraph because of our interest in providing in every possible way for this legislation to advance the programs of the national defense." [25]

The above is quoted because the record is silent as to the reason why the sentence forbidding mandatory registration was deleted during 1948, and presumably one of the reasons for the deletion was comparable to that just quoted.

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[23] Ibid., p. 2593, 1st and 2d cols.
[24] Ibid., p. 2603.
[25] Ibid., p. 2528, 2d col.

6. Detailed congressional comments concerning the Register

Congressman Wadsworth's proposed amendment and comments were the only objection to the Register ever made on the floor of either the House or the Senate during the entire history of discussions from 1945 through 1950. Perhaps this challenge prompted the House committee to insert in the Congressional Record material to support the concept of the Register, which had previously been taken for granted. In any case Congressman Heselton of Massachusetts, a member of the committee who had been active in support of foundation bills since 1947 or earlier, extended his remarks at length on March 7. These comments provide the most detailed information available concerning congressional intent with respect to the Register:

"There is a clear and pressing need for the early development in government of a centralized, integrated program in the scientific manpower field. Insofar as scientists and educators having knowledge of this problem are concerned, there is practically universal agreement that steps be taken at the earliest possible date to develop such a program in anticipation of the early creation of a National Science Foundation. Accordingly, the program discussed here envisages the establishment of a personnel inventory and the development of methods of appraising the Nation's scientific personnel resources and making appropriate plans for the best national use of these resources, both in peace and in war.

"The need for a program of this kind has been felt ever since the end of the war. The National Security Resources Board has recognized the problem, but has deferred formal action pending the possible creation of a National Science Foundation. Final passage of this legislation has been delayed, and, even though the science bill should pass the Congress early in this session, it would be a matter of at least a year, if not more, before the proposed foundation would be in a position to take positive action looking to the operation of the kind of a scientific manpower-inventory program which the Federal Government should carry on.

"In the meantime, a series of circumstances indicate that action in the matter should not be further delayed, and that constructive steps can and should be taken even in advance of the science legislation—steps which will be consistent with the objectives of the Foundation when and if it does come into being. The most pressing circumstance in point of time is represented by the need of a civilian agency of Government to take over the results and to continue the operation of two scientific personnel registration projects sponsored by the Military Establishment through the Office of Naval Research. The first of these projects provided for the registration of the names, locations, and special skills of some 50,000 physical and natural scientists possessing a doctor of philosophy degree or its equivalent. This project was contracted for with the National Research Council, and has been substantially completed. Inventorying of special skills is not a static process, however, and if the full results are to be achieved from the project, the inventory must be continued and maintained on an operating basis, and studies based upon the findings should go forward. The second project results from a contract between the Office of Naval Research and the Engineers Joint Council, covering an assessment and registration of the qualifications of most of the country's highly qualified engineers. This project is in process, and the Office of Naval Research is anxious that its supervision be taken over and that it be operated on a continuing basis under appropriate Federal auspices. As matters stand, the Office of Naval Research regards it as urgent that an appropriate unit of Government assume the responsibility for the continued collection, analysis, and utilization of these data, so that the considerable investment of time and money represented in the projects will be realized.

"All of the approved science bills so far have provided that a roster of scientific personnel will be maintained, and that the Foundation will take over and operate the former national roster. That operation however, at the present time consists only of a series of files which are out of date and stored away without a custodian. It would thus be consistent with the intent of the bill if action should be taken now, looking to the development of an active operation which, when the Foundation is created, could be absorbed as a live and useful activity. To commence the operation now, therefore, would be entirely compatible with the aims and purposes of the proposed Science Foundation, and would permit immediate initiation of an operation which sooner or later will have to be undertaken, thus gaining at least 2 years' time, which would undoubtedly be lost if action were deferred until the Foundation became organized and sufficiently developed to undertake the work.

"As a practical matter, the purposes and objectives of the Science Foundation would be better served if this operation were started now so that when the time came it would have something tangible to take over in the field of scientific personnel. This, coupled with the fact that the important work already done by the Office of Naval Research should not be allowed to lapse or fall into disuse, seems to indicate that much would be gained and nothing would be lost by getting this program underway as soon as it can be organized. And more important than the question of the ultimate location and the organizational character of the activity is the fact that a long-range, carefully planned program in this field is sorely needed and the longer action in the matter is deferred, the longer it will be before results can be obtained.

"The current consideration of this problem accepts the premise that a well-rounded scientific manpower registration program is indispensable to adequate planning for the use, in time of war, of America's trained brains in the technologies and sciences. The need for analytical studies of the problem is accentuated by the fact that the national supply of scientifically trained individuals was markedly depleted by World War II, and that it is only now, 5 years after the end of the war, that the output of fully trained sicentists and technologists is catching up with the rate of production of prewar years.

"On the requirements side, the Government is sponsoring a national research program of unprecedented size in a period when our scientific personnel resources are at a relatively low ebb. Yet, in spite of the clear evidence of disparity between the supply of scientific manpower especially qualified for research and development and the greatly increased requirements for research, no adequate steps have been taken by the Federal Government other than the two projects referred to above to identify or analyze the skills of the national supply of scientists as a means of enabling research adiministrators to plan and administer broad and comprehensive research programs for national defense and for national progress.

"From the standpoint of mobilization planning, precise information should be continuously available with regard to the locations and skills of the country's highly trained scientists and engineers. To develop and improve the national state of readiness, the lack of balance between known supply of, and estimated requirements for, scientific personnel should be examined and as disparities emerge, appropriate steps should be taken to plan for systematic methods of adjusting these imbalances, which may be qualitative as well as quantitative. These steps should include encouragement of fellowship and scholarship programs to increase the potential supply in shortage areas, to identify the fields in which our national position is weakest, and to keep all interested scientific and educational agencies, both governmental and private, aware of where the country stands in the scientific manpower field.

"What is needed at the present time is a small unit located in an appropriate Federal agency to coordinate current activities in the field of scientific manpower registration to provide a basis for the development of long-range plans which will bring about the best utilization of America's scientific personnel resources, both in time of peace and in the event of war, and to encourage the shaping of higher educational training programs to fill known and anticipated gaps in particular scientific fields. This work could and should be commenced immediately in anticipation of its transfer to the National Science Foundation when that agency is in an operating position to take it over.

"The concept of the activity would be that the necessary registration operations be carried out through the councils and the professional societies, and that the coding work and machine studies be carried on contract with such an agency as the Bureau of Labor Statistics, which is equipped for such work. This would avoid the necessity for any considerable clerical operation, and leave the proposed unit free to do the more fundamental task of planning and coordinating the scientific manpower registration program.

"What is recommended is not the creation of a new field of activity, but rather the pulling together in one place, under appropriate auspices, of programs which are now being carried on without any direct top-level coordination or direction. This is equally true with regard to funds, since the amount of money which will be needed to carry on a central operation is now being spent through grants from funds appropriated for defense research. It is emphasized that no new funds, as far as the total Government expenditure is concerned, will be involved in getting this started.

"Upon careful consideration of the administrative problems involved, it seems clear that this is not the kind of activity which could be successfully carried on under the auspices of a part-time or ex officio committee. It requires the full-time attention of a small technical staff guided by scientific groups in the foundation of policies and procedures designed to integrate with the probable functions of the National Science Foundation when that agency is created.

"The importance of this problem is such that further delay in giving positive attention to it could be disadvantageous to the national welfare and to the most effective utilization of the vitally important national resource represented by the country's highly trained scientists and engineers. There follows a series of conclusions based upon the facts with regard to scientific personnel, as they now exist.

CONCLUSIONS

"1. That there is no sound reason for deferring action on this problem pending the creation of the National Science Foundation. This conclusion is supported by the recommendation of a number of leading scientists and educators, as well as the pressing need to do something now to continue the maintenance and use of the results of the somewhat extensive work already done by the Office of Naval Research and the National Research Council in the field.

"2. That the tremendous increases in scientific research and development activities coupled with the wartime depletion of the national supply of scientists as a result of the war, renders the problem more critical than was the case prior to World War II.

"3. That some method of identifying and appraising the skills of America's research scientists is an indispensable tool in the development and allocation of a realistic national-research program, and that the cost of providing such a tool would be negligible in comparison with the national research budget.

"4. That sound planning for the wartime use of scientific personnel cannot be done on a short-range basis. If the wartime task of providing for the distribution of scientific skills to the wartime activities in which they would be most needed is to be successful, steps should be taken now to lay the basis for evolving such a program.

"5. That the correction of imbalances between known supply of, and estimated requirements for, fully qualified scientists can only be made on a long-term basis because of the training time required to produce competent technologists. A program for furnishing advice to institutions of higher learning and others to stimulate the correction of such imbalances should be undertaken at an early date if it is to be effective.

"6. That present inattention to the scientific manpower problem on the part of the Federal Government is due to circumstances rather than as a result of any expressed policy, and that this country is not keeping pace with other world powers in leaving the problem unconsidered.

"7. That the current registration programs being sponsored by various Government agencies, principally in the Department of Defense, should be coordinated and integrated into an economical and effective national program.

"8. That the Federal Government should take the leadership in sponsoring the development in one place of a selective, analytical inventory of the Nation's specially trained and highly skilled personnel in important scientific fields, including the recording and evaluation of special scientific competencies.

"9. That such an inventory is important not only for mobilization planning purposes, but also as an everyday tool in peacetime to assist in the development and maintenance of an adequate program of national research, and to provide a base for such necessary functions as:

"(a) A systematic and continuous study of resources and requirements factors in relation to the national supply of, and the known and potential requirement for, scientific manpower.

"(b) Assistance in the formulation and implementation of the President's point 4 program and other foreign-aid plans involving the provision of technological know-how to other countries.

"(c) The furnishing to other agencies of Government, on a central-service basis, of information concerning scientific manpower which such agencies need for the performance of their own functions, i.e., Atomic Energy Commission's fellowship and research programs, military research programs, Civil Service Commission activities, and the like.

"(d) Project assignments from the National Security Resources Board in connection with plans for the allocation, on a voluntary basis or otherwise as the

wartime case may be, of America's technologically and scientifically skilled citizens to the national research, educational, and military programs in the event of war. It would be too late to expect development of a working program in this area after war should break out.

"(e) Assistance to the Bureau of the Budget in the evaluation and development of programs for the allocation of Federal funds to research activities and educational programs.

"(f) Assistance in the location and analysis of scholarship and fellowship programs to stimulate the training of needed specialists in particular scientific fields.

"(g) Provision of information to the military service concerning the names, numbers, and skills of scientists who are enrolled in the Reserves: information which is not now available in the records of the Armed Forces.

"(h) Consolidation and centralization in one agency of government of various scientific personnel activities which are now being independently carried on under separate Federal auspices to the end that there can be one central point to serve as a clearinghouse in Washington for scientific personnel matters in which the Government has a proper interest.

"(i) The conduct of mobility studies reflecting significant shifts of personnel as between scientific fields and the development of common patterns of occupational relationships between standard technical fields. This type of study is particularly important in connection with rapid occupational shifts which are sometimes needed in wartime.

"(j) The conduct of studies for the purpose of investigating possible correlations between various types of training and experiential patterns and scientific competences, and determining whether there are distinguishable background factors, from the standpoint of training or occupational history or combinations of both, which might be related to professional achievement.

"(k) New fields of research are requiring new combinations of training and experience, combinations not normally produced by accepted curricula. As research and employment in such related fields increase, studies should be made of the recurring needs for such training combinations, the results of which could assist institutions of higher education in connection with curricula adjustment involving deviation from commonly accepted training patterns.

"10. That the registration program should be carried out by the scientific and professional societies, under a coordinating program of the Federal Government relating to the development of standard patterns and evaluation procedures, and the allocation of operating funds where necessary to accomplish the objectives. The program should be one in which American science would play a major part in the formulation of policies and the utilization of results, with the Federal Government directing and coordinating the efforts of the many groups which would participate in the program development.

"11. That an effort should be made to secure the appointment of a small policy or steering committee of outstanding educators and scientists to furnish advice in the formulation of the preliminary policies of the proposed program; immediate relationships should be established with such federated groups as the National Research Council and the American Council on Education, to be followed by working relationships with the various scientific and professional societies. This approach should insure the development of a program which would reflect the judgments of American scientists, rather than a program superimposed by the Federal Government acting unilaterally.

"12. That the program should start with the appointment of a very small organization, probably not more than half a dozen employees, having technical competence to initiate the planning and, with the assistance of scientific groups, to develop over the first months of its operation a sound plan of registration to the end that when the Science Foundation is in a position to do so, it will be able to take over a useful and planned function and will not have to lose the endless months involved in having to start the operation de novo." [29]

Not content with this, on the next day Congressman Heselton further extended his remarks by including the following:

"Mr. HESELTON. Mr. Speaker, I ask unanimous consent to extend by remarks at this point in the Record and include a letter from President Carmichael, of Tufts College, with reference to the National Science Foundation roster.

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[29] Ibid., Mar. 7, 1950, p. 2983, 2d col., through p. 2985, 1st col.

"The SPEAKER. Is there objection to the request of the gentleman from Massachusetts?

"There was no objection.

"Mr. HESELTON. Mr. Speaker, under permission granted to me, I now include at this point in the Record the letter from President Carmichael to which I referred: [27]

"Hon. JOHN W. HESELTON,
"*House of Representatives, Washington, D.C.*

"DEAR MR. HESELTON: Word has reached me that you would be willing to have me express my views in connection with the pending legislation to establish a National Science Foundation, and particularly with regard to that section of the bill providing for the establishment and maintenance of a roster of scientific and specialized personnel. I am very grateful to you for allowing me to write you about these matters.

"As you may know, I was particularly concerned with the problem of scientific personnel during the war. I served during the war as director of the national roster of scientific and specialized personnel which was established in 1940. The roster was a mechanism for analyzing the scientific personnel potential of the Nation at that time. It provided a means for channeling into the war effort, both in and out of uniform, many of the Nation's highly trained scientists and technologists.

"I do not need to emphasize that the scientists and other highly trained technologists and experts of America represent a vitally important national resource. Nor is it necessary to call attention to the dramatic role that the American scientist and technologist played in World War II. Since 1945, however, little definitive action has been taken as far as the Federal Government is concerned to develop an active planning program to insure the fullest use of our supply of scientifically trained citizens should another emergency occur. This has been a matter of concern to many scientists and educators who are interested in scientific manpower planning. The drain upon our already small reservoir of scientific skills, produced by our present increased research programs, coupled with the depletion of our national scientific pool through the interruption of higher education during World War II; provides adequate reason to believe that in a number of important fields the national supply of fully trained scientists is insufficient to meet wartime needs should this country be thrust into another emergency.

"In spite of clear evidence concerning the disparity between available scientific manpower for research and technological development and the unprecedented need for such research, no long-range program has been undertaken by the Federal Government to identify and analyze the skills of the existing national supply of scientists so that in an emergency period these skills could be used to greatest advantage. Similarly, there is no accurate information available as to the extent and character of our national scientific manpower deficit, either in quantitative or, as is more important, in qualitative terms. Comprehensive studies are needed to prepare a basis for logical plans for meeting the increased demands for such existing trained individuals should the Nation again be forced into a war. Mobilization planning concerning industrial facilities and strategic materials automatically provides for a continuous assessment of existing facilites and natural resources. It seems to me, therefore, that it is all the more important in the field of scientific manpower to have such a national appraisal continuously available. Scientists can only be developed after long years of painstaking selection and training. Unlike many other wartime resources, scientists cannot be quickly or synthetically produced.

"I should further emphasize that the implications of the maintenance of a national roster are perhaps more important in time of peace than as a measure for preparedness for war. The point of departure for adequate planning for scholarship and fellowship programs designed to increase our national supply of scientists is an assessment of the existing skills and distribution among scientific fields of our present scientific population. The proposed roster of scientists would provide such a base."

President Carmichael then summarized the 11 immediate uses of the proposed national roster, which I inserted in my remarks under conclusion No. 9, which will be found at page 2984 of yesterday's Record.

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[27] Ibid., Mar. 8, 1950, p. 3037, 2d col., through p. 3038, 1st col.

"May I also call one further fact to your attention? It will probably be a matter of many months, if not a year, under the best of circumstances before a National Science Foundation could be created to undertake the type of detailed operation involved in the development and maintenance of an inventory of scientists. The problem of scientific personnel is so important that there is much effective work which can and should be started now so that when the Foundation is ready to take over the function it will have the advantage of absorbing an operating program already underway. In this connection, I should particularly mention two projects for the registration of scientists which have been developed by the Office of Naval Research with the assistance of the National Research Council and the Engineer's Joint Council. A considerable amount of time and effort have been expended in commencing the development of these lists. Unless action is taken promptly to continue this development, the records thus far secured will fall into disuse and the Science Foundation will have to commence the project from the beginning. I have been advised by the staff of the National Security Resources Board, which has made a study of this problem, that the Office of Naval Research would welcome some interim action whereby the studies it has commenced can be continued in anticipation of the creation of the Science Foundation. I have been further advised that the National Security Resources Board is taking active steps to initiate a program of the registration of scientific personnel which the Foundation can take over and operate when it is in a position to do so. I think this interim action is necessary and most desirable. I am certain it will be welcome to those who will be responsible for directing the functions of the Science Foundation when it is activated.

"In conclusion, may I state that I appreciate your efforts in support of the overall science legislation which is of such great importance to the security and welfare of the Nation. This country must maintain its place of leadership among the nations in science. Please let me know if I can be of any possible service in assisting in providing information that may help in the final passage of this legislation. As this letter suggests, I am especially interested in the personnel aspects of science planning. Sometimes even very great physical scientists and engineers seem to forget that their own personal knowledge of the skill of a few colleagues is not enough when planning must be done on a national basis for some great research or development project. A strong America both in war and in peace demands, it seems to me, a real knowledge of the total potential of our specially trained national manpower. I am delighted that you are so deeply interested in this problem. I am especially grateful for your remarks in reply to Mr. Wadsworth concerning the relationship of a roster of scientists and the National Academy of Sciences. I am a member of the National Academy of Sciences and I have been a chairman of one of the divisions of the National Research Council. I can assure you that the Academy does not now and for various reasons probably never can maintain a full roster of scientists. If the roster were maintained by a proper agency of the Federal Government it would be of great assistance to the National Academy in performing the functions assigned to it in 1863.

"May I take this opportunity to send you my very best personal greetings.

"Yours very truly,

"LEONARD CARMICHAEL."

7. Final enactment in 1950

On March 1, 1950, the House passed H.R. 4846 by a vote of 247 to 126. They then immediately substituted the contents of this bill for S. 247, by voice vote, and sent it to the Senate.[28]

On March 27, 1950, the Senate disagreed with the House substitution and appointed conferees (Senators Thomas, of Utah, Murray, of Montana, Lehman, of New York, Taft, of Ohio, and Smith, of New Jersey.[29] On the next day the House also appointed conferees (Congressmen Priest, of Tennessee, Biemiller, of Wisconsin, and Wilson, of Oklahoma).[30]

The conferees presented their report to the House on April 27 (H. Rept. No. 1958).[31] In general the House provisions had prevailed, but a few changes had been worked out in conference. Since both the House and Senate revisions contained the same register provision, there was no discussion of the register.

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[28] Congressional Record, House, Mar. 1, 1950, p. 2603.
[29] Congressional Record, Senate, Mar. 27, 1950, p. 4069, 2d col.
[30] Congressional Record, House, Mar. 28, 1950, p. 4231, 1st col.
[31] Congressional Record, House, Apr. 27, 1950, pp. 5899–5906.

The Senate-House conferees had agreed unanimously, and after some discussion the House passed the amended bill (S. 247) by voice vote.[32]

The Senate considered the same report on the following day and after brief discussion passed the same bill by voice vote.[33]

On May 10, 1950, the bill was signed by the President and became law.[34]

8. A brief review

Over 1,200 pages of testimony were given by 150 of the Nation's leading authorities in science, education, and medicine, followed by further public hearings during March and April 1949.[35] In addition, debates and references to Foundation legislation were found on a total of 448 pages of the Congressional Record.[36] A total of seven reports were issued by Senate and House committees.[37] Senator Magnuson summed up the situation in 1948, 2 years before the debates had been consummated in legislation, when he said:

"I think the bill represents as much work as has any bill I have known of in Congress, and that as much testimony had been taken regarding it as regarding any other measure."[38]

All of the above-described material except the direct testimony of witnesses has been carefully reviewed by the author of this staff paper, and every reference to the register therein recorded in full in the preceding pages.

Over this period of time, 1945 through 1950, almost all other aspects of proposed National Science Foundation legislation were debated at length and at times heatedly in both Senate and House, and numerous revisions were made in nearly all except the register provisions. Among these much-debated provisions were powers of the Director versus the Board, size and composition of the Board, the division to be established, scholarships versus graduate fellowships, geographical distribution versus merit allocation of grant funds, support of nuclear and medical research, whether social sciences should be included, basic versus applied research, jurisdictional relationships with other Federal agencies, private versus Federal support of research and related taxation policy, patent provisions, security, level of funding of the Foundation, etc. Yet the register was never challenged but once, and then unsuccessfully, the challenge being only with reference to who should maintain it.

JUNE 24, 1950.

Mr. E. L. KEENAN,
Deputy Assistant Director for Manpower,
Office of Civil and Defense Mobilization,
Washington, D.C.

DEAR MR. KEENAN: As you know, the committee has been finishing up a series of hearings in regard to scientific manpower and education, part of which has been dealing with the tabulation and keeping track of scientific and technical personnel.

I am sorry that the timing of these hearings did not permit a representative from your Office to appear before the committee. However, the committee would appreciate having any statements or comments which you might care to make for inclusion in the permanent record. We are, of course, very much interested in the need for this sort of thing from the viewpoint of OCDM, and I believe it would be helpful to us to have such views available prior to making a report on this subject.

If you could provide us with any information, data, studies, and/or recommendations by July 6, I am sure the committee could make excellent use of it.

Sincerely yours,

PHILIP B. YEAGER.

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[32] Congressional Record, House, Apr. 27, 1950, p. 5908, 3d col.
[33] Congressional Record, Senate, Apr. 28, 1950, pp. 5960–5968.
[34] Public Law 507, ch. 171, 81st Cong., 2d sess.
[35] H. Rept. No. 796, June 14, 1949 (H.R. 4846), p. 6.
[36] Count by author of present staff paper, from bound volume in NSF Library, Q180U5A43.
[37] Bound volume in NSF Library, Q11N301. (This includes 6 reports, but not H. Rept. No. 2223 (H.R. 6007), 1948.
[38] Congressional Record, Senate, May 4, 1948, p. 5382, 3d col.

EXECUTIVE OFFICE OF THE PRESIDENT,
OFFICE OF CIVIL AND DEFENSE MOBILIZATION,
Washington, D.C., July 7, 1959.

Mr. PHILIP B. YEAGER,
Special Consultant, Committee on Science and Astronautics,
House of Representatives, Washington, D.C.

DEAR MR. YEAGER: This is in reply to your letter of June 24 in which you requested our comments or recommendations relative to the draft bill which you have had under consideration. I have taken the opportunity to have the proposal discussed by a subcommittee of the Interagency Manpower Policy Committee, and to some extent my comments are derived from that discussion. The Interagency Manpower Policy Committee is composed of senior representatives from the departments of the Federal Government which have a primary interest in manpower matters and is chaired by this Office.

To begin with, I am convinced myself of the need for a register of scientific and technical personnel similar to that being maintained by the National Science Foundation. In my opinion the format of the register is a technical matter which can best be worked out by the National Science Foundation working in conjunction with the U.S. Employment Service, which will probably be the principal using agency in the event of an emergency.

The bill calls for the establishment of a committee of representatives of interested departments and agencies "to make an intensive study of the need, both governmental and nongovernmental, for a permanent, comprehensive, and continually current record of scientific and technical personnel throughout the United States * * *." It also proposes to investigate certain collateral questions, such as whether the best results could be expected through compulsory or voluntary means.

I am generally of the opinion that our present process for examining from time to time the operating principles of the register, such as we are doing this year through the Interagency Manpower Policy Committee, accomplishes most of the purposes for which the bill was drawn. It would take a lengthy report to cover current thinking on all of the issues raised by the proposed bill, for example the question of compulsory registration. However, these issues have been examined from time to time within the executive branch of the Government, and in my judgment the present arrangement represent an acceptable accommodation to the realities of cost and problems of maintenance.

I would like to point out that the views expressed in this letter are my own and do not necessarily represent the formal position of the Office of Civil and Defense Mobilization. However, should the Congress decide to go ahead with a study of the nature proposed in the bill, I am certain this agency would cooperate to the fullest possible extent. In this connection, I would suggest that the Office of Civil and Defense Mobilization be included among those represented should such a committee be formed.

Sincerely,

E. L. KEENAN,
Deputy Assistant Director for Manpower.

JUNE 23, 1959.

Mr. ROGER W. JONES,
Chairman, U.S. Civil Service Commisison,
Washington, D.C.

DEAR MR. CHAIRMAN: This committee has been endeavoring to make a thorough study of the need for keeping track of our national scientific and technical personnel, as well as how to go about doing so and what is actually being done.

In this regard, I have been authorized by the chairman to request that the Civil Service Commission furnish us with general information on its roster of scientists and engineers in the Federal Government.

We would like to make this information a part of the committee's record of hearings on this subject. We would thus appreciate receiving from you as much background information on the development of your roster as you may have available and also current information in regard to its operation and uses. It would be most helpful to us if we could have this information as soon as possible since the committee hopes to issue a report on the subject within several weeks.

Very sincerely yours,

PHILIP B. YEAGER, *Special Consultant.*

CIVIL SERVICE COMMISSION,
Washington, D.C., July 7, 1959.

Mr. PHILIP B. YEAGER,
Special Consultant, Committee on Science and Astronautics,
House of Representatives, Washington, D.C.

DEAR MR. YEAGER: In reply to your letter of June 25, 1959, we are forwarding information concerning the establishment by the U.S. Civil Service Commission of the roster of scientists and engineers in the Federal service at the equivalent of grade GS–13 and above.

The roster was developed as a result of a specific recommendation to the President by the Committee on Scientists and Engineers for Federal Government Programs. Among other actions designed to improve the program for maintaining highly skilled professional and technical personnel in the Federal service, the Committee recommended that the "Civil Service Commission develop, by major disciplines, rosters of scientists and engineers at GS–13 and above for referral, as needed, for appropriate vacancies throughout the Federal service."

In order to provide coordination with the general register of scientific and technical personnel administered by the National Science Foundation, the Civil Service Commission invited the Foundation to participate in development of the more specific and detailed roster of Federal scientists and engineers.

The preliminary planning, including design of forms to provide necessary information was done by members of the Commission's staff and representatives of the Foundation and the various Federal agencies.

On October 8, 1958, departmental Circular No. 968 ,subject: Roster of Scientists and Engineers in the Federal Service (copy attached), was issued to the heads of departments and agencies directing them to file a questionnaire (Standard Form 9—copy attached) for each scientist and engineer then employed by the Federal Government in the positions listed in attachement No. 1 to departmental Circular 968 at the equivalent of grade GS–13 and above. The objectives of the roster as stated in the departmental circular are:

"The roster will provide the U.S. Government with an official record of the scientists and engineers at the equivalent of GS–13 and above in the Federal service.

"It will provide each agency with a ready index of their participating scientific and engineering personnel so that whenever possible positions at higher levels can be filled from within the agency.

"It will provide a ready source of highly skilled personnel available for use throughout Government where scarce scientific and engineering specialties may be needed.

"Finally, we believe it will provide greater career opportunity within the Federal service for scientific and engineering personnel."

The roster was established on March 6, 1959. At that time departmental Circular No. 968, supplemental supplement No. 1 (copy attached) was issued to all departments and agencies informing them of the establishment of the roster with instructions on its use. While there have been additions to it since its establishment, we believe that the roster is now substantially a complete listing of scientists and engineers at GS–13 and above in the fields covered. The roster now contains approximately 21,000 names. Of this number approximately 14,000 are engineers, and 7,000 scientists.

While the roster has only recently been established, agencies have begun to make use of it in their search for personnel to fill vacancies in highly specialized scientific and engineering fields.

Some of the mechanics of the roster which may be of interest are as follows:

When the qualifications questionnaire is received in the Commission the detailed information is coded to IBM cards (card attached). It is then possible to identify persons with unusual skills for quick referral in response to agency needs. It is also possible to provide various types of statistical information as well as special listings of agency personnel.

The Commission has offered all Federal agencies employing professional and scientific personnel copies of the IBM cards for their own employees in order that they may establish their own listings and make skills inventories or statistical studies without the necessity of duplicating the coding process. Agencies are availing themselves of this offer.

Provision is being made for keeping the data current. Under the plan we will forward to agencies periodically a machine listing of their scientists and engineers on the roster with the request that the agency correct the listing to

show deletions, promotions and reassignments and any other pertinent information. In addition, the agencies will be requested to submit Standard Forms 9 (background questionnaire) for all persons who have been added in the interim to their rolls in the categories covered.

From time to time questions have arisen concerning inclusion of additional occupational areas and lower grade levels. Before considering such expansion, we wish to have some experience in the operation of the roster. Serious consideration will be given to expansion at a later date if warranted by our operating experience and our resources so permit.

It is possible after receiving the enclosed material you will wish more detailed information or have specific questions. If so, please do not desitate to call on us.

Sincerely yours,

ROGER W. JONES, *Chairman.*

CIVIL SERVICE COMMISSION,
Washington, D.C., October 8, 1958.

DEPARTMENTAL CIRCULAR No. 968

To: Heads of Departments and Agencies.
Subject: Roster of scientists and engineers in the Federal service,

NOTE.—This departmental circular requires report within 30 days.

The Committee on Scientists and Engineers for Federal Government Programs recommended the development of a roster covering a majority of the scientists and engineers now employed by the Federal Government at the equivalent of GS–13 and above. The President brought this recommendation to the attention of the Chairman of the Civil Service Commission, by letter, recommending consideration and action as expeditiously as possible in accordance with the provisions of committee's report. Following consultation with the National Science Foundation, it was decided to make this a joint project in order that National Science Foundation could also use the information for their National Register of Scientific and Technical Personnel.

1. *Purpose of roster.*—The roster will provide the U.S. Government with an official record of the scientists and engineers at the equivalent of GS–13 and above in the Federal service.

It will provide each agency with a ready index of their participating scientific and engineering personnel so that whenever possible positions at higher levels can be filled from within the agency.

It will provide a ready source of highly skilled personnel available for use throughout Government where scarce scientific and engineering specialties may be needed.

Finally, we believe it will provide greater career opportunity within the Federal Service for scientific and engineering personnel.

Recruiting officials interested in personnel outside their own agency will be required to contact the personnel office of the agency in which the person works before establishing contact with the person concerned. Persons will not be referred across agency lines without regard for agency programs or needs.

2. *Procedure.*—We have devised, with agencies' assistance, a questionnaire, SF 9 which will provide the necessary detailed information for both the Civil Service Commission and the National Science Foundation. Headquarters of agencies are requested to have each person complete the SF 9 who is now serving at the equivalent of GS–13 and above in the scientific and engineering fields in the specialties listed on the back of this circular. Those employees whose positions are not under the Classification Act should be included if their duties are substantially the same as those included in this list. These forms are to be forwarded by the agency to the Civil Service Commission not later than 30 days from the date of receipt of this Departmental circular for those employees in the continental United States. Sixty days will be allowed for persons outside the continental United States. Where a scientist or engineer is not available, the personnel office should send us his name, position title, series, and grade and state the approximate date he will be in a position to complete his questionnaire. In the event a scientist or engineer declines to complete his questionnaire, the personnel office should complete its part of the questionnaire and return the questionnaire to the Civil Service Commission stating the reason for declination. The Civil Service Commission would welcome an earlier return of the forms for departmental employees and such field employees as can be readily contacted.

3. *Basic qualifications.*—All persons with or without civil service status now serving at the equivalent of grade GS–13 or above in positions listed on the back of this circular should be included. Include also all those persons whose positions are not under the Classification Act but whose duties are substantially the same as those of the positions listed on the back page.

4. *Coding system.*—The codes and code structures used have been developed by agreement with the National Science Foundation.

As you will recall, the Commission, at the request of the agencies, has eliminated the codes listed below from its classification standards. Personnel offices may wish to give additional information to personnel now occuping these codes.

(*a*) The Highway Research Engineering Series GS–821, the Highway Design Engineering Series GS–822, and the Highway Construction and Maintenance Engineering Series GS–823 have been rescinded. Positions formerly in these series are now included in the Highway Engineering Series GS–820.

(*b*) As a result of occupational studies the Commission has determined that ordnance engineering work is more appropriately classified in the various subject matter engineering series. Therefore, the Ordnance Engineering Series GS–835 and the Ordnance Design Engineering Series GS–836 have been recently abolishd. Engineers whose titles have not yet been officially changed from Ordnance Engineer should refer to the subcodes under Mechanical Engineering (830), Electronic Engineering (855), General Engineering (801) or other appropriate engineering codes in selecting their specialties.

Please note that the specialties list does not, as a rule, list titles with the words "design," "research," "development," "specifications," and "test" as these describe functions and are covered in item 11 of the questionnaire.

5. *Procurement of SF–9 and attachments.*—The Commission is furnishing the headquarters office of each agency with this circular and sufficient number of forms and attachments to cover their scientists and engineers now serving at GS–13 and above. Future requirements for these forms will be procured from the Federal Supply Service, region 3, stores depot, in the usual manner for procuring standard forms.

6. *Preparation and submission of forms.*—Standard Form 9 may be prepared in triplicate if desired (carbons may be used), the original for the Civil Service Commission, one copy for the agency and one copy for the participating employee. Personnel offices should complete items 1 through 6 before forwarding the forms to the participating scientist or engineer. One copy of the attachments, 1 and 2, will also be given to the participating scientist or engineer with the forms. After the scientist or engineer has completed the forms he will forward the original and one copy to the personnel office. Please return the original copy, rather than the carbon copy to the Civil Service Commission, since a microfilm of this form will be made for the use of the National Science Foundation for its Register.

7. *Rosters at GS–12 and below for agency use.*—Agencies which establish rosters at GS–12 and below for their own use will procure Standard Forms 9 for this purpose from GSA, as described above. Only two copies of the SF–9 (one for the agency and one for the employee) together with one copy of attachment No. 1 are necessary for rosters at these levels. Attachment No. 2 is not appropriate for use at GS–12 and below.

8. *Inquiries.*—Inquiries concerning the program and this departmental circular should be made to the Career Service Section, Examining Division, Code 129, extension 3281 or 4600. Completed questionnaires should be mailed to the Career Service Section, Examining Division, Civil Service Commission, Washington 25, D.C.

9. This report has been approved by the Bureau of the Budget in accordance with the Federal Reports Act of 1942.

WARREN B. IRONS, *Executive Director.*

[Attachment 1 to DC 968(1)]

LIST OF JOB TITLES AND/OR GS SERIES INCLUDED IN SURVEY OF SCIENTISTS AND ENGINEERS

ENGINEERS

All professional engineers in GS 800–899 series.

AGRICULTURAL SCIENCES

GS 407 Agronomy
GS 491 Dairy manufacturing technology
GS 1659 Fishery methods and equipment
GS 492 Fishery products technology
GS 460 Forestry
GS 450 General agricultural administration
GS 437 Horticulture
GS 487 Husbandry
GS 495 Meat technology
GS 454 Range conservation
GS 457 Soil conservation
GS 470 Soil sciences

LIFE SCIENCES

GS 420 Bacteriology
GS 401 Biology
GS 430 Botany
GS 414 Entomology
GS 482 Fishery research biology
GS 440 Genetics
GS 493 Home economics
GS 494 Microanalysis
GS 403 Microbiology
GS 431 Mycology
GS 415 Nematology
GS 412 Parasitology

LIFE SCIENCES—continued

GS 405 Pharmacology
GS 413 Physiology
GS 434 Plant pathology
GS 435 Plant physiology
GS 433 Plant taxonomy
GS 486 Wildlife research biologist
GS 410 Zoology
GS 411 Zoology (systematic)

MATHEMATICS AND STATISTICS

GS 1510 Actuary
GS 1540 Cryptography
GS 1520 Mathematician
GS 1530 Statistics

PHYSICAL AND EARTH SCIENCES

GS 1330 Astronomy
GS 1370 Cartography
GS 1320 Chemistry
GS 1312 Electronic research, development, and test series
GS 1372 Geodesy
GS 150 Geography
GS 1350 Geology
GS 1313 Geophysical exploration, survey, and investigation
GS 1321 Metallurgy
GS 1340 Meteorology
GS 1360 Nautical science
GS 1301 Physical science administration
GS 1310 Physics
GS 1390 Technology

UNITED STATES CIVIL SERVICE COMMISSION

Washington 25, D.C.

MARCH 6, 1959.

DEPARTMENTAL CIRCULAR NO. 968, SUPPLEMENT NO. 1

To: Heads of departments and agencies.
Subject: Roster of scientists and engineers in the Federal service.

The roster of scientists and engineers in the Federal service for the positions listed in the basic departmental circular and at the equivalent of GS–13 and above is now available for use by Federal agencies.

In order that effective use may be made of the roster, agencies are requested to observe the following procedures:

(*a*) It is to the benefit of both agencies and the Commission to restrict the use of the roster to authorized personnel officials of agencies or their designated representatives. Requests should originate from these officials.

(*b*) The roster is maintained through machine cards. When requesting information from the roster, the agency representative should make his requests to the Commission in advance, either by telephone or in writing, in order that adequate time may be allowed to make a machine run. Ordinarily 24 hours' advance notice will be sufficient for runs limited to one specialty code and one grade.

(*c*) Conditions under which this roster was established, require agencies to get permission from the employing agency before contacting a scientist or engineer whose name was secured from this roster. Such contact must be made with the appropriate personnel officials of the agency.

Field installations of agencies desiring information from the roster should make arrangements through the appropriate personnel officials of their headquarters in the Washington metropolitan area.

Agencies, if they so desire, may make arrangements with the Commission to procure a set of machine cards of their own employees covered by this roster. These cards and the code book will be available as soon as possible after April 1, 1959. In order to facilitate use of these cards and the entire roster, you may wish to designate someone to work with the Commission on the scientist and engineer roster.

Telephone calls may be made to Sterling 3–5200 (code 129) extensions 4600, 3097, or 3281. Written communications should be addressed to:

Roster of Scientists and Engineers in the Federal Service,
Career Service Section, Examining Division,
U.S. Civil Service Commission,
Washington 25, D.C.

WARREN B. IRONS, *Executive Director.*

Standard Form 9
AUGUST 1958
U. S. CIVIL SERVICE COMMISSION
DEPARTMENTAL CIRCULAR No. 968

U. S. CIVIL SERVICE COMMISSION AND THE NATIONAL SCIENCE FOUNDATION
WASHINGTON, D. C.

ROSTER OF SCIENTISTS AND ENGINEERS IN THE FEDERAL SERVICE

Part I

TO BE COMPLETED BY PERSONNEL OFFICE OF AGENCY—PLEASE TYPE

1. ..... (FIRST NAME) ..... (MIDDLE) ..... (MAIDEN, IF ANY) ..... (LAST) ..... 2. ☐ MALE ☐ FEMALE

3. ACTIVITY NAME ..... (AGENCY) ..... (BUREAU OR OTHER DESIGNATION) ..... (ACTIVITY)

4. ADDRESS OF THE ACTIVITY .....

5. POSITION ..... (TITLE) ..... (GS-SERIES, IF ANY) ..... (GRADE) ..... (SALARY) ..... 6. DATE ENTERED PRESENT GRADE ..... (MONTH) ..... (YEAR)

Part II

TO BE COMPLETED BY THE ENGINEER OR SCIENTIST

(Please read the attached information sheet before attempting to answer this questionnaire—use a supplemental sheet if necessary)

7. DATE OF BIRTH ..... (DAY) ..... (MONTH) ..... (YEAR) ..... PLACE OF BIRTH ..... (STATE OR COUNTRY)

8. ☐ U. S. CITIZEN ☐ U. S. CITIZENSHIP APPLIED FOR ☐ NON U. S. CITIZEN (SPECIFY COUNTRY) .....

9. (A) COLLEGE, UNIVERSITY, OR OTHER PROFESSIONAL EDUCATION (ADD LOCATION FOR IDENTIFICATION)	MAJOR SUBJECT	DEGREE (IF NONE, NUMBER OF YEARS)	YEAR OF DEGREE

(B) LIST ANY IMPORTANT SUBJECTS NOT SHOWN UNDER MAJOR SUBJECT .....

10. THIS ITEM IS CONCERNED WITH THE SPECIALTY MOST IMPORTANT TO YOUR PRESENT POSITION. ENTER ITS CODE NUMBER AND NAME FROM THE ATTACHED SPECIALTIES LIST. IF YOU DO NOT FIND YOUR SPECIALTY LISTED WRITE IT IN THE SPACE BELOW.

CODE NO. ..... NAME OF SPECIALTY .....

U. S. GOVERNMENT PRINTING OFFICE : 1958—O-479279

41502—59—pt. 2——8

11 PRESENT POSITION: THIS QUESTION REFERS TO THE FUNCTIONS PERFORMED IN YOUR PRESENT POSITION. IF YOU ADMINISTER, DIRECT, MANAGE, OR COORDINATE PROGRAMS, PLEASE CHECK IN APPROPRIATE PLACE UNDER (A). PLEASE INDICATE THE FUNCTIONS PERFORMED BY YOU IN THE ORDER OF THEIR IMPORTANCE BY ENTERING "1," "2," ETC., ON THE APPROPRIATE LINES UNDER (B).

(A) ADMINISTER, DIRECT, OR MANAGE YES ..... NO ..... COORDINATE YES ..... NO .....

(B) (THE FUNCTIONS ARE LISTED IN ALPHABETICAL ORDER, AS ARE COMBINATIONS OF FUNCTIONS.)

..... 71 ANALYSIS OF INFORMATION AND OPERATIONS (INCLUDING INTELLIGENCE)
..... 32 CLINICAL PRACTICE
..... 61 CONSTRUCTION
..... 81 CONSULTING (SPECIFY)
..... 62 CONTRACTS
..... 11 DESIGN
..... 12 DEVELOPMENT
..... 02 FIELD EXPLORATION, SURVEYS
..... 73 INSPECTION AND EVALUATION
..... 60 INSTALLATION
..... 83 MAINTENANCE
..... 84 OPERATION
..... 42 PATENTS
..... 43 PERSONNEL (INCLUDING DEVELOPMENT)
..... 54 PLANNING
..... 75 PROCESS CONTROL
..... 85 PRODUCTION
..... 74 PRODUCTION AND PROCESS CONTROL
..... 91 PURCHASING
..... 65 REGULATIONS—ENFORCEMENT
..... 64 REGULATIONS—PREPARATION
..... 01 RESEARCH
..... 00 RESEARCH AND DEVELOPMENT
..... 40 SPECIFICATIONS
..... 21 TEACHING
..... 72 TESTING
..... 46 TECHNICAL EDITING
..... 41 TECHNICAL WRITING
..... 99 OTHER (SPECIFY)

.....

.....

12. SHOW TOTAL YEARS OF PROFESSIONAL EXPERIENCE RELATING TO YOUR PRESENT POSITION .....

13. GIVE BELOW IN ORDER OF DECREASING COMPETENCE UP TO THREE SPECIALTIES IN WHICH YOU HAVE HAD PROFESSIONAL EXPERIENCE AND/OR TRAINING. PLEASE CONSULT THE ACCOMPANYING SPECIALTIES LIST AND USE THE TITLE AND CODE NUMBER IF IT IS AVAILABLE.

1. ..... (CODE NO.) (NAME OF SPECIALTY) 2. ..... (CODE NO.) (NAME OF SPECIALTY) 3. ..... (CODE NO.) (NAME OF SPECIALTY)

14. WHAT DO YOU CONSIDER YOURSELF PRIMARILY TO BE, I. E., METALLURGIST, SAFETY ENGINEER, ETC.? .....

15. OTHER EMPLOYMENT EXPERIENCE. PLEASE SELECT TWO POSITIONS YOU HAVE OCCUPIED PREVIOUSLY WHICH MOST ACCURATELY REFLECT YOUR SPECIALIZED PROFESSIONAL BACKGROUND. PLEASE REFER TO THE SPECIALTIES LIST AND USE THE CODE NUMBER IF IT IS AVAILABLE. DO NOT LIST HERE YOUR PRESENT POSITION.

1. .....
(AGENCY OR FIRM) (ADDRESS) (DATES OF EMPLOYMENT)

.....
(TITLE OF POSITION) (CODE NO.) (NAME OF SPECIALTY MOST IMPORTANT TO JOB) (PRINCIPAL FUNCTION)

2. .....
(AGENCY OR FIRM) (ADDRESS) (DATES OF EMPLOYMENT)

.....
(TITLE OF POSITION) (CODE NO.) (NAME OF SPECIALTY MOST IMPORTANT TO JOB) (PRINCIPAL FUNCTION)

16. COLLEGE TEACHING EXPERIENCE (GIVE NAME OF SCHOOL, SUBJECTS AND NUMBER OF YEARS TAUGHT)

17. UNIQUE PROFESSIONAL QUALIFICATIONS, SUCH AS UNUSUAL PROFESSIONAL SKILLS:

18. LIST NATIONAL PROFESSIONAL AND TECHNICAL SOCIETIES IN WHICH YOU HAVE MEMBERSHIP, INDICATING TYPE OF MEMBERSHIPS: MEMBER, ASSOCIATE, FELLOW, ETC.

SOCIETY	TYPE OF MEMBERSHIP

19. LIST LANGUAGES YOU HAVE STUDIED OR USED, OTHER THAN ENGLISH, AND CHECK ONE OR MORE DESCRIPTIVE PHRASES OF EACH:

NAME OF LANGUAGE	SPEAK FLUENTLY	READ FLUENTLY	READ SCIENTIFIC MATERIAL	SLIGHT KNOWLEDGE

20. LIST ANY GEOGRAPHICAL AREAS (FOREIGN OR U. S.) OF WHICH YOU HAVE SPECIALIZED SCIENTIFIC OR ENGINEERING KNOWLEDGE AS IN METEOROLOGY, GEOLOGY, ETC., WITH SPECIALIZATION:

GEOGRAPHICAL AREA	TOTAL YEARS EXPERIENCE IN GEOGRAPHICAL AREA	DATE OF LAST ACTIVITY IN AREA	STATE NATURE OF YOUR SCIENTIFIC OR ENGINEERING KNOWLEDGE

21. LIST BELOW THE FOREIGN COUNTRIES WITH WHICH YOU ARE FAMILIAR BY RESIDENCE, EXTENDED TRAVEL, OR STUDY.

COUNTRY OR AREA	TOTAL YEARS RESIDENCE	YEAR LAST VISITED	NATURE OF YOUR KNOWLEDGE

22. MILITARY STATUS—THIS ITEM IS DESIGNED TO RECORD YOUR MILITARY STATUS AS OF THE TIME YOU COMPLETE THE QUESTIONNAIRE:

(A) ☐ NO RESERVE STATUS ☐ READY RESERVIST (SUBJECT TO IMMEDIATE CALL) ☐ STANDBY RESERVIST

(B) ☐ ARMY ☐ NAVY ☐ AIR FORCE ☐ MARINE CORPS ☐ OTHER

23. GEOGRAPHIC AVAILABILITY FOR EMPLOYMENT: ASSUMING THERE IS A CHALLENGING POSITION IN ANOTHER AREA, WOULD YOU CONSIDER A TRANSFER TO IT? IF SO INDICATE THE AREA FOR WHICH YOU WOULD BE AVAILABLE. 1. ANYWHERE .... 2. CONTINENTAL U. S. .... 3. EASTERN U. S. .... 4. CENTRAL U. S. .... 5. WESTERN U. S. .... 6. OVERSEAS (SPECIFY AREA OR COUNTRY) .....
7. OTHER (SPECIFY) .....

24. ARE YOU LISTED IN ANY OF THESE? 1. ☐ AMERICAN MEN OF SCIENCE 2. ☐ WHO'S WHO IN AMERICA 3. ☐ WHO'S WHO IN ENGINEERING 4. ☐ CHEMICAL WHO'S WHO 5. ☐ OTHER (SPECIFY) .....

25. LIST MAJOR HONORS AND/OR AWARDS WITH NAME OF AWARDING GROUP AND YEAR OF RECEIPT (USE SUPPLEMENTAL SHEET IF NECESSARY): .....

26. LIST UP TO 5 MAJOR SCIENTIFIC OR ENGINEERING PUBLICATIONS AND NAME OF JOURNAL IN WHICH PUBLISHED. INDICATE TOTAL NUMBER OF PUBLICATIONS IF DESIRED (USE SUPPLEMENTAL SHEET IF NECESSARY): .....

27. LIST IMPORTANT INVENTIONS AND PATENTS, ETC. (USE SUPPLEMENTAL SHEET IF NECESSARY): .....

28. WHAT DO YOU CONSIDER TO BE YOUR MAJOR ACCOMPLISHMENT IN YOUR PROFESSIONAL FIELD? .....

29. ADDITIONAL INFORMATION AND COMMENTS: (INCLUDE ANY PROFESSIONAL LICENSE OR REGISTRATION WHICH YOU HOLD AND STATE IN WHICH ISSUED.) (USE A SUPPLEMENTAL SHEET IF MORE SPACE IS NEEDED. BE SURE TO PUT YOUR NAME AND DATE OF BIRTH ON ANY SUPPLEMENTAL SHEETS SUBMITTED.) PLEASE FILL OUT EMPLOYMENT HISTORY ON SUCCEEDING PAGE.

DATE QUESTIONNAIRE PREPARED ..... SIGNATURE .....

OFFICE TELEPHONE NO. ..... HOME ADDRESS .....

U. S. GOVERNMENT PRINTING OFFICE : 1968—O-679279

OFFICE TELEPHONE NO. ..... HOME ADDRESS .....

U.S. GOVERNMENT PRINTING OFFICE : 1968—O-478-775

EMPLOYMENT RECORD TO ACCOMPANY SF 2

(Roster of Scientists and Engineers in the Federal Service)

NAME ..... AGENCY ..... DATE OF BIRTH .....

DATES OF EMPLOYMENT	POSITION, GRADE, AND EMPLOYER		BRIEF DESCRIPTION OF DUTIES INCLUDING SPECIALTIES AND FUNCTIONS
1. PRESENT POSITION FROM—	POSITION TITLE	GRADE AND/OR SALARY	
	NAME AND ADDRESS OF EMPLOYER		
	NAME AND ADDRESS OF SUPERVISOR		
2. FROM—	POSITION TITLE	GRADE AND/OR SALARY	
TO—	NAME AND ADDRESS OF EMPLOYER		
	NAME AND ADDRESS OF SUPERVISOR		
3. FROM—	POSITION TITLE	GRADE AND/OR SALARY	
TO—	NAME AND ADDRESS OF EMPLOYER		
	NAME AND ADDRESS OF SUPERVISOR		

DATES OF EMPLOYMENT	POSITION, GRADE, AND EMPLOYER		BRIEF DESCRIPTION OF DUTIES INCLUDING SPECIALTIES AND FUNCTIONS
4. FROM-- TO--	POSITION TITLE	GRADE AND/OR SALARY	
	NAME AND ADDRESS OF EMPLOYER		
	NAME AND ADDRESS OF SUPERVISOR		
5. FROM-- TO--	POSITION TITLE	GRADE AND/OR SALARY	
	NAME AND ADDRESS OF EMPLOYER		
	NAME AND ADDRESS OF SUPERVISOR		
6. FROM-- TO--	POSITION TITLE	GRADE AND/OR SALARY	
	NAME AND ADDRESS OF EMPLOYER		
	NAME AND ADDRESS OF SUPERVISOR		

DATE PREPARED ..... SIGNATURE .....

(U.S. GOVERNMENT PRINTING OFFICE: 1961 O-479670)

Attachment 2 to SF 9

INFORMATION SHEET

Roster of Scientists and Engineers in the Federal Service

To the Participating Scientist or Engineer:

PLEASE READ BEFORE COMPLETING THE QUESTIONNAIRE

The Committee on Scientists and Engineers for Federal Government Programs recommended the development of a roster of the scientists and engineers now employed by the Federal Government at the equivalent of GS–13 and above. The Committee excluded from the initial roster scientists in the social and medical fields and certain allied disciplines but included other disciplines that apply to medical as well as other fields. The Civil Service Commission was directed to establish such a roster. It is now in the process of doing so, in cooperation with the National Science Foundation, which maintains the National Register of Scientific and Technical Personnel.

The roster will be based upon a qualifications questionnaire which has been developed in close cooperation with representatives of the National Science Foundation and those agencies which are the major users of scientists and engineers. The Department of the Navy's experience with an internal scientific and engineering roster has been particularly valuable in developing this questionnaire.

INFORMATION ON COMPLETING QUESTIONNAIRE

What agency personnel officers are asked to do

Agency personnel officers have been requested to complete the first part of the questionnaire to make certain that we have official titles, correct series and grade designations, or salaries in the case of agencies which do not use the GS series and grades, before passing the questionnaire on to you. Agency personnel officers will also transmit the completed questionnaires to the Civil Service Commission. Do not hesitate to consult with your personnel officer if you need to do so.

What you are asked to do

There are attached copies of the questionnaire and one specialties list.

Review the specialties list. Engineers will find that the coding follows the GS codes now in use in the Federal service. The subheadings under engineering are arranged alphabetically as are the specialties under each subheading. If your skill is that of an aeronautical engineer, aircraft flight test, code 861–07 will show that you are an aeronautical engineer with this particular specialty. If, however, you are an aeronautical research engineer, you will check research under 11b of the questionnaire and 861–00 (aeronautical engineer) or whatever code under 861–00 is appropriate to show your specialty.

The specialties list does not include functional titles of research, test, development, etc. These are to be found under question 11b of the questionnaire.

The scientists will find that the specialties list follows the National Science Foundation specialties list with which they may be familiar.

The specialties and functions listed by you will be recorded on punchcards to show your qualifications in your field.

Attached to the last page of the questionnaire you will find a record-of-employment form. This form is attached at the request of a majority of the scientists and engineers who participated in a recent pilot study of this questionnaire. It is urged that you fill out the record-of-employment form in order to provide a more complete picture of your qualifications and experience.

If you wish, you may keep the specialties list, this information sheet, and a copy of the questionnaire.

Please read the questionnaire through and then answer all questions. Should you have difficulty with any of them, contact your personnel office for assistance.

It was not possible to cover in detail all possible specialties. If your specialty is not listed, please write it in. In this way we can revise and update the specialties list from year to year.

What the roster means to the Government and to you

This roster will provide the U.S. Government with an official record of the scientists and engineers at the equivalent of GS–13 and above in the Federal service.

It will provide each agency with a ready index of the skills of their participating scientific and engineering personnel so that wherever possible positions at higher levels can be filled from within the agency.

It will provide a ready source of highly skilled personnel for newly established positions where knowledge of Federal operations is often important.

Finally, we believe it will provide greater career opportunity within the Federal service for scientific and engineering personnel.

DUPLICATION OF EFFORT

The National Register of Scientific and Technical Personnel of the National Science Foundation, as a joint sponsor with the Civil Service Commission, has accepted this questionnaire in lieu of the questionnaires utilized by them through professional societies. The National Science Foundation will attempt to avoid further contact of scientists and engineers who have completed these questionnaires.

To avoid duplication of effort, the Navy Department, which already has a roster of its scientific and engineering personnel, the Army Department, which has been planning a similar roster, and the other agencies, have agreed to use this questionnaire, thereby relieving scientists and engineers of the task of filling out more than one. Punchcards will be prepared from information on the questionnaire, and all agencies which are employers of scientists and engineers will be furnished on request copies of the cards of their own employees. We hope that the establishment and maintenance of this roster will eliminate many demands previously made on you for information concerning your skills and experience.

UP-TO-DATE INFORMATION

The roster will be kept current by an inquiry form designed to bring information up to date on a regular time basis.

Thank you for your cooperation in filling out your questionnaire.

[Attachment 1 to SF 9]

SPECIALTIES LIST—ROSTER OF SCIENTISTS AND ENGINEERS IN THE FEDERAL SERVICE

ENGINEERING

861-00—AERONAUTICAL ENGINEERING
(See also airways engineering and internal combustion powerplant engineering)
861-01—General
861-02—Aerodynamic heating
861-03—Aerodynamic loads
861-04—Aerodynamic theory
861-05—Aerodynamics
861-06—Aeronautical engineer and pilot
861-07—Aircraft flight test
861-08—Aircraft performance
861-09—Aircraft structural loads
861-10—Automatic stability and control
861-11—Compressors and turbines
861-12—Flight systems
861-13—Flutter and vibration
861-14—Hydrodynamics
861-15—Landing loads
861-16—Landing loads theory
861-17—Propeller performance
861-18—Propulsion aerodynamics
861-19—Rotary wing
861-20—Rotary wing aerodynamics
861-21—Stability and control
861-22—Stress analysis
861-23—Structures
861-24—Structures theory
861-99—Other (specify)
890-00—AGRICULTURAL ENGINEERING
890-01—General
890-02—Conservation
890-03—Farm electrification
890-04—Farm machinery
890-05—Farm structures
890-06—Processing machinery
890-99—Other (specify)
862-00—AIRWAYS ENGINEERING
808-00—ARCHITECTURAL ENGINEERING
808-01—General
808-02—Estimates
808-03—Specifications
808-99—Other (specify)
832-00—AUTOMOTIVE ENGINEERING
832-01—General
832-02—Amphibious combat vehicles
832-03—Armored high-speed tractors
832-04—Armored utility carriers
832-05—Automotive components
832-06—Buses
832-07—Combat vehicles
832-08—Cycles
832-09—Fighting tanks

SPECIALTIES LIST—ROSTER OF SCIENTISTS AND ENGINEERS IN THE FEDERAL SERVICE—Continued

ENGINEERING—continued

832-10—Gun motor carriages
832-11—Tractor trucks
832-12—Trailers
832-13—Transport vehicles
832-14—Trucks
832-99—Other (specify)
824-00—BRIDGE ENGINEERING (State specialty)
892-00—CERAMIC ENGINEERING
892-01—General
892-02—Abrasives
892-03—Cements, limes, plasters
892-04—Clay
892-05—Glass
892-06—Kilns, furnaces
892-07—Protective and refractory coating for metals
892-08—Refractories
892-99—Other (specify)
893-00—CHEMICAL ENGINEERING
893-01—General
893-02—Biochemical processes
893-03—Electrochemical processes
893-04—Inorganic processes
893-05—Isotopes separation
893-06—Nuclear processes
893-07—Organic processes
893-99—Other (specify)
810-00—CIVIL ENGINEERING
810-01—General
810-02—Airports
810-03—City planning
810-04—Railroads
810-05—Soil mechanics
810-06—Specifications and estimates
810-07—Water and power
810-99—Other (specify)
811-00—CONSTRUCTION ENGINEERING
811-01—General
811-02—Airfields
811-03—Air navigation facilities
811-04—Buildings
811-05—Canals and laterals
811-06—Dams
811-07—Fortifications
811-08—Industrial plants
811-09—Powerlines and switchyards
811-10—Powerplants and pumping stations
811-11—Process plants (atomic and nuclear)
811-12—Railroads
811-13—Technical buildings
811-14—Underground utilities
811-15—Waterborne structures
811-16—Waterfront structures
811-17—Waterways and harbors
811-99—Other (specify)
850-00—ELECTRICAL ENGINEERING
850-01—General
850-02—Aircraft systems
850-03—Illumination
850-04—Power generation
850-05—Power resources and systems
850-06—Power transmission and distribution
850-07—Rotating machinery
850-08—Servomechanisms
850-09—Shipboard systems
850-99—Other (specify)
855-00—ELECTRONIC ENGINEERING
855-01—General
855-02—Computers
855-03—Electronic circuitry
855-04—Electron tubes
855-05—Guidance and control (missile systems)
855-06—Instrumentation (excluding computers)
855-07—Instrumentation (atomic and nuclear)
855-08—Radar
855-09—Radio
855-10—Sonar
855-11—Telecommunication (specify system)
855-12—Telemetering
855-13—Television systems
855-14—Wire communication (telephone)
855-15—Wire communication (other)
855-99—Other (specify)
804-00—FIRE-PREVENTION ENGINEERING
801-00—GENERAL ENGINEERING
801-01—General
801-02—Instrumentation
801-03—Instrumentation (atomic and nuclear)
801-04—Nuclear
801-05—Nuclear power systems (state specialty)
801-06—Ordnance
801-07—Reactor
801-08—Water and power
801-99—Other (specify)
820-00—HIGHWAY ENGINEERING (State specialty)
813-00—HYDRAULIC ENGINEERING
813-01—General
813-02—Hydrologic investigations
813-03—Power investigations
813-04—Sedimentation investigations
813-05—Structures

SPECIALTIES LIST—ROSTER OF SCIENTISTS AND ENGINEERS IN THE FEDERAL SERVICE—Continued

ENGINEERING—continued

813–06—Water resources investigations
813–99—Other (specify)
896–00—INDUSTRIAL ENGINEERING
896–01—General
896–02—Industrial analysis
896–03—Facility plans
896–04—Facility utilization
896–05—Quality assurance and control
896–99—Other (specify)
834–00—INTERNAL COMBUSTION POWERPLANT ENGINEERING
834–01—General
834–02—Aeronautical gas turbine powerplant
834–03—Aeronautical jet powerplant
834–04—Aeronautical powerplant
834–05—Aeronautical powerplant (combustion)
834–06—Aeronautical powerplant (design evaluation)
834–07—Aeronautical powerplant (installations)
834–08—Aeronautical powerplant (fuels and combustion)
834–09—Aeronautical powerplant (fuels and lubrication)
834–10—Aeronautical powerplant (propulsion systems controls)
834–11—Aeronautical powerplant (propulsion systems controls theory)
834–12—Aeronautical powerplant (structures)
834–13—Aeronautical powerplant (theory)
834–14—Aeronautical reciprocating powerplant
834–15—Aeronautical rocket powerplant
834–16—Aeronautical rocket powerplant (theory)
834–17—Automotive powerplant
834–18—Marine gas turbine powerplant
834–19—Marine powerplant
834–20—Marine powerplant fuel and lubrication
834–21—Marine reciprocating powerplant
834–99—Other (specify)
805–00—MAINTENANCE ENGINEERING
870–00—MARINE ENGINEERING
870–01—General
870–02—Boiler and combustion accessories
870–03—Heat exchange
870–04—Machinery and piping arrangements
870–05—Pipes, valves, fittings
870–06—Plant design
870–07—Propellers and shafting
870–08—Pumps, blowers, compressors
870–09—Reciprocating engines
870–10—Turbines and reduction gears
870–99—Other (specify)
806–00—MATERIALS ENGINEERING
806–01—General
806–02—Nuclear materials
806–99—Other (specify)
830–00—MECHANICAL ENGINEERING
830–01—General
830–02—Aircraft equipment
830–03—Aeronautical research facilities (state specialty)
830–04—Applied mechanics (state specialty)
830–05—Industrial equipment
830–06—Instrumentation and control
830–07—Ordnance
830–08—Powerplant
830–09—Utilities
830–99—Other (specify)
METALLURGICAL ENGINEERING (See metallurgy under physical and earth sciences)
880–00—MINING ENGINEERING
880–01—General
880–02—Metal
880–03—Mine development and production
880–04—Mine examination and exploration
880–05—Mineral
880–06—Mining health and safety
880–07—Mining methods
880–08—Nonmetal
880–09—Solid fuels
880–99—Other (specify)
871–00—NAVAL ARCHITECTURE
871–01—General
871–02—Air-conditioning systems
871–03—Arrangements
871–04—Hull equipment and fittings
871–05—Hull piping
871–06—Hydromechanics
871–07—Scientific design and calculations
871–08—Small crafts and boats
871–09—Stability
871–10—Structural
871–99—Other (specify)
830–07—ORDNANCE ENGINEERING (See general engineering, mechanical engineering, electronic engineering, and other appropriate series)

SPECIALTIES LIST—ROSTER OF SCIENTISTS AND ENGINEERS IN THE FEDERAL SERVICE—Continued

ENGINEERING—continued

881-00—PETROLEUM PRODUCTION AND NATURAL-GAS ENGINEERING
881-01—General
881-02—Natural-gas
881-03—Petroleum
881-99—Other (specify)
803-00—SAFETY ENGINEERING
819-00—SANITARY ENGINEERING
819-01—General
819-02—Air pollution
819-03—Insect and rodent control
819-04—Radiation products control
819-05—Sewage and industrial wastes
819-06—Water pollution control
819-07—Water supply
819-99—Other (specify)
812-00—STRUCTURAL ENGINEERING
812-01—General
812-02—Building
812-03—Floating structures
812-04—Foundations
812-05—Hydraulic structures
812-99—Other (specify)
897-00—VALUATION ENGINEERING
897-01—General
897-02—Communications
897-03—Electric public utilities
897-04—Gas and petroleum
897-05—Industrial plants
897-06—Mining
897-07—Pipelines
897-08—Railroads
897-99—Other (specify)
894-00—WELDING ENGINEERING

SCIENCES

Life Sciences

ANATOMY
000-0—Anatomy, general
001-0—Embryology
002-0—Microscopic, histology
003-0—Morphology
004-0—Neuroanatomy
005-0—Systematic
006-0—Topographic
009-9—Other (specify)

PHARMACOLOGY
010-0—Pharmacology, general
011-0—Chemical
012-0—Chemotherapy, experimental therapeutics
013-0—Drug enzymology
014-0—Organ systems
015-0—Pharmacodynamics
016-0—Standardization
016-1—Toxicology
017-0—Neuropharmacology, psychopharmacology
018-0—Analgesics and narcotics
018-1—Cardiac stimulants
018-2—Insulin
018-3—Organic arsenicals
018-4—Sex hormones
019-9—Other (specify)

PHYSIOLOGY
020-0—Physiology, general
021-0—Cellular, comparative
022-0—Endocrine
023-0—Gastrointestinal
024-0—Heart, circulation, blood
025-0—Muscle, neurophysiology
026-0—Renal; salt, water balance
027-0—Respiratory
028-0—Work-exercise
029-9—Other (specify)

NUTRITION AND METABOLISM
030-0—Nutrition and metabolism, general
031-0—Metabolism
032-0—Requirements, deficiencies
033-0—Nutrient value of foods
034-0—Carbohydrates
035-0—Proteins, amino acids
036-0—Fats, lipids
037-0—Trace elements
038-0—Vitamins, enzymes
039-9—Other (specify)

HOME ECONOMICS
963-0—Home economics, general
963-1—Food quality and use
963-2—Human nutrition
963-9—Other (specify)

PATHOLOGY
040-0—Pathology, general
041-0—Comparative
042-0—Clinical
043-0—Cytopathology, histopathology
044-0—Experimental
045-0—Hematology
046-0—Oncology
049-9—Other (specify)

BIOPHYSICS
050-0—Biophysics, general
051-0—Bioacoustics
052-0—Bioelectricity
053-0—Biomechanics
053-1—Antigravitational effects
054-0—Bio-optics
055-0—Molecular science
056-0—Radiation biology

SPECIALTIES LIST—ROSTER OF SCIENTISTS AND ENGINEERS IN THE FEDERAL SERVICE—Continued

SCIENCES—continued

Life Sciences—Continued

057–0—Theoretical biophysics
058–0—Thermobiology
058–1—Heat effects on human life
059–9—Other (specify)

MICROBIOLOGY

060–0—Microbiology, general
061–0—Antibiotics
062–0—Metabolism of micro-organisms
063–0—Physiology of micro-organisms
064–0—Bioassay
065–0—Clinical microbiology
066–0—Epidemiology
067–0—Immunology
068–0—Fermentation products
071–0—Serology
072–0—Soil microbiology
073–0—Taxonomy and morphology
074–0—Virology and rickettsial disease
075–0—Food microbiology
076–0—Biologicals
077–0—Dairy microbiology
078–0—Medical microbiology
079–9—Other (specify)

MYCOLOGY

069–0—Mycology, general
069–1—Experimental
069–2—Taxonomy
069–9—Mycology, other (specify)

PARASITOLOGY

070–0—Parasitology, general.
070–1—Medical.
070–2—Medical chemotherapy.
070–3—Veterinary.
070–4—Veterinary chemotherapy.
070–9—Other (specify).

GENETICS

080–0—Genetics, general.
081–0—Animal.
082–0—Human.
083–0—Micro-organisms.
084–0—Plant.
085–0—Population studies.
089–9—Other (specify).

ZOOLOGY

090–0—Zoology, general.
091–0—Protozoology.
093–0—Annelids and helminths.
093–1—Coelenterates.
093–2—Crustacea.
093–3—Echinoderms.
093–4—Mollusks.
093–5—Invertebrate, other (specify).
094–0—Herpetology.
095–0—Ichthyology.
096–0—Mammalogy.
097–0—Ornithology.
098–0—Vertebrate, other (specify).
099–9—Other (specify).

ENTOMOLOGY

100–0—Entomology, general.
101–0—Agricultural.
101–1—Apiculture.
102–0—Taxonomy.
103–0—Control techniques (specify).
104–0—Animal insect pests.
104–1—Plant insect pests.
105–0—Insect physiology, morphology.
106–0—Medical.
109–9—Other (specify).

ECOLOGY

110–0—Ecology, general.
111–0—Animal.
112–0—Plant.
113–9—Other (specify).

HYDROBIOLOGY

115–0—Hydrobiology, general.
116–0—Limnology.
117–0—Marine biology.
118–0—Biological oceanography.
119–9—Other (specify).

BOTANY

120–0—Botany, general.
121–0—Cytology.
122–0—Morphology.
126–0—Plant physiology.
127–0—Nutrition and growth.
129–9—Other (specify).

PLANT TAXONOMY

128–0—General.
128–1—Higher plants.
128–2—Lower plants.
128–9—Other (specify).

PHYTOPATHOLOGY

130–0—Phytopathology, general.
131–0—Bacterial, disease.
132–0—Control measures (specify).
133–0—Crop disease(s) (specify crops).
134–0—Fungicides.
135–0—Fungus diseases.
136–0—Nematode diseases.
137–0—Surveys, identification.
138–0—Virus diseases.
139–9—Other (specify).

OTHER BIOLOGICAL SPECIALTIES

190–0—Aerobiology.
191–0—Biogenesis, evolution.
192–0—Biogeography, biophysiography.
193–0—Blood banking.
194–0—Techniques, methodology.
195–0—Biometrics and biostatistics.
196–0—Biological warfare agents.
198–0—GENERAL BIOLOGY unspecialized.
199–9—BIOLOGY, other (specify).

SPECIALTIES LIST—ROSTER OF SCIENTISTS AND ENGINEERS IN THE FEDERAL SERVICE—Continued

SCIENCES—continued

Agricultural Sciences

ANIMAL HUSBANDRY

140–0—Animal husbandry, general.
141–0—Breeding.
142–0—Large animals.
143–0—Small animals.
144–0—Poultry.
145–0—Nutrition.
146–0—Physiology.
149–0—Other (specify).

FISH AND WILDLIFE

150–0—Fish and wildlife, general.
150–1—Shellfish.
151–0—Food habits.
152–0—Habitat influences.
152–1—Fresh-water fisheries.
152–2—Marine fisheries.
152–3—River-basin studies.
153–0—Propagation and management.
154–0—Population dynamics, biometrics.
150–9—Other (specify).

HORTICULTURE

155–0—Horticulture, general.
156–0—Breeding, hybridization.
157–0—Fruits.
158–0—Vegetables.
159–0—Pathology, fruits and vegetables.
159–1—Psysiology, fruits and vegetables.
155–9—Other (specify).

FORESTRY

160–0—Forestry, general.
161–0—Forest management.
162–0—Forest and wood products.
163–0—Silviculture.
163–1—Pathology of forest plants.
163–2—Physiology of forest plants.
164–9—Other (specify).

RANGE SCIENCE

165–0—Range science, general.
166–0—Management.
169–9—Other (specify).

AGRONOMY

170–0—Agronomy, general.
171–0—Crop breeding, hybridization.
172–0—Field crops.
172–1—Pathology, field crops.
172–2—Physiology, field crops.
173–0—Pastures.
174–0—Weeds.
175–9—Other (specify).

SOIL SCIENCE

176–0—Soil science, general.
177–0—Soil conservation.
178–0—Fertility; management.
179–9—Other (specify).

Earth Sciences

GEOPHYSICS

300–0—Geophysics, general.
301–0—Seismology.
302–0—Terrestrial magnetism and electricity.
303–0—Physics of the upper atmosphere.
304–0—Exploration, petroleum, and natural gas.
305–0—Exploration, mineral deposits.
306–0—Instrumentation.
307–0—Geodesy.
309–9—Other (specify).

GEOCHEMISTRY

310–0—Geochemistry, general.
311–0—Natural waters.
312–0—Carbonaceous materials.
313–0—Rocks and minerals.
314–0—Isotope geology and radioactivity.
319–9—Other (specify).

GEOLOGY

320–0—Geology, general.
321–0—Areal and field geology.
322–0—Mineralogy, determinative.
323–0—Mineralogy, crystallography.
324–0—Sedimentary petrology.
325–0—Igneous petrology.
326–0—Metamorphic petrology.
327–0—Invertebrate paleontology
328–0—Vertebrate paleontology
329–0—Paleobotany.
330–0—Micropaleontology.
331–0—Stratigraphy.
332–0—Structural geology, igneous and metamorphic.
333–0—Structural geology, sedimentary.
334–0—Economic geology, metals.
335–0—Economic geology, nonmetals.
336–0—Economic geology, ground-water.
337–0—Economic geology, coal.
338–0—Petroleum geology, surface exploration.

SPECIALTIES LIST—ROSTER OF SCIENTISTS AND ENGINEERS IN THE FEDERAL SERVICE—Continued

SCIENCES—continued

Earth Sciences—Continued

339–0—Petroleum geology, subsurface.
340–0—Petroleum geology, other (specify).
341–0—Engineering geology.
342–0—Military geology.
343–0—Geomorphology.
344–0—Laboratory.
344–1—Museum.
344–9—Other (specify).

HYDROLOGY

345–0—Hydrology, general.
346–0—Surface streams and lakes.
347–0—Ground-water hydrology.
348–0—Cryology.
349–9—Other (specify).

OCEANOGRAPHY

350–0—Dynamic oceanography.
351–0—Physical oceanography.
352–0—Chemical oceanography.
353–0—Ocean-bottom sediments.
354–0—Beach and shore processes.
355–0—Underwater sound.
359–9—Other (specify).

METEOROLOGY

338–0—Meteorology, general.
360–0—Synoptic meterology, general.
361–0—Observations.
362–0—Analysis.
363–0—Short-range forecasting.
364–0—Extended-range forecasting.
365–0—Objective forecasting.
366–0—Numerical forecasting.
367–0—Hydrometeorology.
368–0—Micrometeorology.
369–0—Instrumentation.
370–0—Physical or dynamic meteorology, general.
371–0—Experimental physical and dynamic meteorology.
372–0—Turbulence, diffusion.
373–0—Cloud physics.
374–0—Weather modification.
375–0—Radar meteorology.
376–0—Climatology, general.
377–0—Bioclimatology.
378–0—Upper atmosphere meteorology.
379–0—Polar meteorology.
380–0—Tropical meteorology.
381–0—Marine meteorology.
382–0—Agricultural meteorology.
383–0—Aviation meteorology.
384–0—Military meteorology.
385–0—Atmospheric pollution.
386–0—Fallout patterns.
389–9—Other (specify).

GEOGRAPHY

390–0—Geography, general.
391–0—Physical.
392–0—Economic.
393–0—Human.
393–1—Political.
393–2—Population.
394–0—Regional (specify regions).
395–0—Cartography.
396–0—Urban.
397–0—Regional planning.
398–0—Military.
399–9—Other (specify).

SURVEYING, MAPPING, PHOTOGRAMMETRY

307–0—Geodesy.
395–0—Cartography.
771–0—Cadastral surveys.
772–0—Engineering surveys.
773–0—Topography.
774–0—Hydrography.
775–0—Photogrammetry.
776–0—Photo interpretation.
779–9—Other (specify).

Mathematics and Statistics

BASIC MATHEMATICS

400–0—Algebra
410–0—Number theory
416–0—Logic
420–0—Analysis
436–0—Topological algebraic structures
440–0—Topology
450–0—Geometry
460–0—Mathematical statistics

THEORY AND PRACTICE OF COMPUTATION

470–0—Computation, general
470–1—Mathematical theory of numerical analysis
471–0—Nomography and tables
472–0—Logical design of computing systems
473–0—Programing desk computers
474–0—Programing standard punchcard equipment
475–0—Programing digital computer systems
476–0—Programing analog systems
479–9—Computation, other (specify)

MATHEMATICS OF RESOURCE USE

481–0—Operations research
482–0—Activity analysis, linear programing
483–0—Weapons systems evaluation
484–0—Logistics, inventory and replacement theory
489–9—Other (specify)

SPECIALTIES LIST—ROSTER OF SCIENTISTS AND ENGINEERS IN THE FEDERAL SERVICE—Continued

SCIENCES—continued

Mathematics and Statistics—Continued

OTHER MATHEMATICAL SPECIALTIES

490-0—Actuarial mathematics, general
490-1—Life
490-2—Property
490-3—Other actuarial (specify)
491-0—CRYTOGRAPHY
498-0—MATHEMATICS, general
499-9—MATHEMATICS, other (specify)

Statistics (Except mathematical statistics)

940-0—STATISTICS, general
941-0—SURVEY STATISTICS, general
941-1—Agriculture
195-1—Biology
935-1—Demography
480-0—Economics
941-2—Education
941-3—Engineering
941-4—Health and medicine
941-5—Operations and administration
941-6—Physical science
941-7—Social science
941-9—Survey statistics, other specify)
942-0—ANALYTIC STATISTICS, general
942-1—Agriculture
195-2—Biology
935-2—Demography
480-2—Economics
942-2—Education
942-3—Engineering
942-4—Health and medicine
942-5—Operations and administration
942-6—Physical science
942-7—Social science
942-9—Analytical statistics, other (specify)
944-9—Statistics, other (specify)

Physics

SOLID STATE

500-0—Solid state physics, general
501-0—Physics of metals
502-0—Semiconductors
503-0—Crystalline state
504-0—Dielectrics (including fluids)
505-0—Magnetism
506-0—Piezoelectricity
507-0—Radiation damage
508-0—Glasses and high polymers
509-9—Other (specify)

ELECTRICITY AND MAGNETISM

510-0—Electricity and magnetism, general
511-0—Electromagnetic fields
512-0—Microwaves
513-0—Radiowaves
514-0—Electron dynamics
515-0—Gas discharge
516-0—Electrical measurements and instruments
517-0—Thermionic and secondary emission
518-0—Physical electronics
519-9—Other (specify)

OPTICS

520-0—Optics, general
521-0—Physical optics
522-0—Geometric optics
523-0—Physiological and psychological optics
524-0—Photography
525-0—Optical instruments
526-0—Spectroscopic devices
527-0—Colorimetry, photometry
528-0—Infrared
529-9—Other (specify)

ACOUSTICS

530-0—Acoustics, general
531-0—Architectural acoustics
532-0—Noise and vibrations
533-0—Audio communications acoustics
534-0—Physiological and psychological acoustics
535-0—Sound transmission through liquids
536-0—Ultrasonics
537-0—Acoustical instruments
539-9—Other (specify)

MECHANICS AND HEAT

540-0—Mechanics and heat, general
541-0—Hydrodynamics
542-0—Aerodynamics and shockwaves
543-0—High pressure phenomena
544-0—Rheology
545-0—Cryogenics
546-0—Heat radiation and transmission
547-0—Thermodynamics
549-9—Other (specify)

SPECIALTIES LIST—ROSTER OF SCIENTISTS AND ENGINEERS IN THE FEDERAL SERVICE—Continued

SCIENCES—continued

Physics—Continued

ATOMIC AND MOLECULAR PHYSICS

550–0—Atomic and molecular physics, general
551–0—Structure and properties
552–0—Atomic and molecular spectra
553–0—Isotopes
554–0—X-rays
555–0—Photoelectric phenomena
559–9—Other (specify)

NUCLEAR PHYSICS

560–0—Nuclear physics, general
561–0—Reactors
562–0—Particle accelerators
563–0—Particle detectors
564–0—Other instruments
565–0—High energy physics, cosmic rays
566–0—Nuclear structure and properties
567–0—Radioactivity
568–0—Nuclear spectra
569–0—Nuclear reactions
570–0—Nuclear scattering
571–0—Magnetic resonance
572–9—Other (specify)

THEORETICAL PHYSICS

573–0—Theoretical physics, general
574–0—Statistical mechanics and kinetic theory
575–0—Field theory
576–0—Analytical mechanics
577–0—Relativity and gravitation
578–0—Quantum mechanics
579–9—Theoretical physics, other (specify)

OTHER PHYSICS SPECIALTIES

580–0—Servomechanisms
581–0—Instrumental measurement and control
582–0—Health physics
583–0—Explosives, jets, rockets, terminal ballistics
584–0—Flight of missiles
585–0—GENERAL PHYSICS.
586–9—PHYSICS, other (specify).

Astronomy

ASTRONOMY

587–0—Astronomy, general
588–0—Astrophysics
589–0—Physics of the sun
590–0—Physics of planets, satellites
591–0—Astrometry
592–0—Celestial mechanics
593–0—Design of astronomical instruments
594–0—Navigation, astronautics
595–0—Photoelectric photometry
596–0—Photographic photometry
597–0—Spectroscopy of astronomical sources
598–0—Star systems and statistical astronomy
599–0—Radio astronomy
599–9—Other (specify)

Chemistry

ANALYTICAL CHEMISTRY

600–0—Analytical chemistry, general
601–0—Assaying
602–0—Classical methods
603–0—Electrochemical methods
604–0—Forensic chemistry
605–0—Microchemistry
606–0—Tracer methods
607–0—Instrumental and optical methods
608–0—Spectroscopy and spectrometry
609–9—Other (specify)

AGRICULTURAL AND FOOD CHEMISTRY

610–0—Agricultural and food chemistry, general
611–0—Cereals and fermentation products.
612–0—Beverages; carbohydrates
613–0—Insecticides and pesticides
614–0—Soils and fertilizers
615–0—Dairy products, fats and oils
616–0—Phytochemistry
617–0—Fruits and vegetables
618–0—Meats, seafood, and poultry
619–9—Other (specify)

BIOCHEMISTRY

900–0—Biochemistry, general
901–0—Clinical
902–0—Endocrine
903–0—Enzyme, vitamin
904–0—Microbiological, cytohisto-chemistry (including nucleic acids)
905–0—Physical
906–0—Oncology
907–0—Biochemorphology
908–0—Technology; methodology
909–9—Other (specify)

INORGANIC CHEMISTRY

620–0—Inorganic chemistry, general
621–0—Fine chemicals
622–0—Heavy chemicals

SPECIALTIES LIST—ROSTER OF SCIENTISTS AND ENGINEERS IN THE FEDERAL SERVICE—Continued

SCIENCES—continued

Chemistry—Continued

623–0—Fluorescent minerals
624–0—Industrial and other gases
625–0—Metals
626–0—Pigments (including carbon black)
627–0—Radioactive materials (purification and separation)
628–0—Theoretical inorganic chemistry
629–0—Inorganic syntheses.
694–0—Cement and related building materials.
695–0—Glass, clay products, refractories, enamels for metals.
620–9—Other (specify).

ORGANIC CHEMISTRY

630–0—Organic chemistry, general.
631–0—Adhesives, glues, sizes.
632–0—Carbohydrates.
633–0—Coal and coal products.
634–0—Dyes and inks.
635–0—Explosives and rocket fuels.
636–0—Fine chemicals.
637–0—Heavy chemicals.
638–0—Leather, tanning materials, collagen.
639–0—Rubber, natural or synthetic, related products.
640–0—Textiles: Natural or synthetic fibers, related products.
641–0—Oils, fats, and waxes.
642–0—Organic syntheses.
643–0—Paints, enamels, and varnishes.
644–0—Petroleum products.
645–0—Petroleum by-products, derivatives, synthetic fuels, asphalts, gases.
646–0—Resins and plastics.
647–0—Soaps and detergents.
648–0—Synthetic alcohols and solvents.
649–0—Theoretical organic.
650–0—Wood, paper, pulp, cellulose.
651–0—Organo-metallic compounds.
652–0—Organo-silicon compounds.
653–0—Organo-halogen compounds.
654–0—Proteins and amino acids.
659–9—Other (specify).

PHYSICAL CHEMISTRY

660–0—Physical chemistry, general.
661–0—Adsorption and absorption.
662–0—Atomic and nuclear structure, radio-chemistry.
662–1—Radioisotopes.
663–0—Colloid chemistry.
664–0—Electrochemistry and dielectrics.
665–0—Explosives.
665–1—Rocket fuels.
666–0—Photochemistry.
667–0—Theoretical (including reaction mechanisms and kinetics).
668–0—Thermodynamics and thermochemistry.
669–0—Ion exchange and applications.
670–0—Catalysts; catalytic materials.
671–0—Corrosion and inhibition.
672–0—Vacuum techniques.
673–0—Crystallography.
675–0—Polymers and elastamers.
679–9—Other (specify).

PHARMACEUTICAL CHEMISTRY

680–0—Pharmaceutical chemistry, general.
681–0—Cosmetics.
682–0—Drugs and medicines (natural and synthetic).
683–0—Pharmacology and pharmacognosy.
689–9—Other (specify).

OTHER CHEMISTRY SPECIALTIES

691–0—Chemical warfare agents.
692–0—Industrial wastes.
693–0—Water, sewage, and sanitation chemistry.
698–0—CHEMISTRY, general.
699–9—CHEMISTRY, other (specify).

METALLURGY AND METALLURGICAL ENGINEERING

750–0—Metallurgy, general.
745–0—Benefication, mineral dressing.
751–0—Iron and steel extraction.
752–0—Nonferrous extraction.
753–0—Electrometallurgy.
754–0—Powder metallurgy.
755–0—Physical metallurgy.
755–1—Metallography.
756–0—Foundry.
757–0—Metal treatment and fabrication.
759–9—Metallurgy, other (specify).

STATEMENT OF THE NATIONAL SCIENCE FOUNDATION, JUNE 1959

For the House Committee on Science and Astronautics regarding the register of scientific and technical personnel

PURPOSE

Previous testimony before the committee on May 5, 1959, reported generally on the programs of the National Science Foundation's Division of Scientific Personnel and Education. The present statement has been prepared to provide more specific information on the Register of Scientific and Technical Personnel in response to the request made by the committee's staff.

STATUTORY BASIS OF REGISTER

The committee will recall the general nature of the provision under which the register was established. The National Science Foundation Act provides in section 3(a)(8) that the Foundation shall "maintain a register of scientific and technical personnel * * *." There are no specifications as to level, scope, or character of coverage, nor does the record of the debate, when the act was under congressional consideration, provide many guidelines.

Originally facing the problem of the scope and character of the register to be established, the Foundation employed the services of several consultants in 1952, including Dr. Dael Wolfle, then Director of the Commission on Human Resources and Advanced Training. Earlier programs of registration of scientific and professional personnel were reviewed, needs were discussed with representatives of the scientific community and others, and recommendations submitted for the Foundation's register program. Dr. Wolfle's report suggested certain principles which were accepted by the Foundation and became the basis for the establishment of the present register.

PRESENT REGISTRATION OPERATION

The National Register of Scientific and Technical Personnel maintains records on the location, training, and scientific specializations of scientists and engineers. Individual scientists voluntarily provide this informaton to their professional societies which, in turn, pass it along to the register records center, which is maintained for the National Science Foundation on a contract basis by North Carolina State College. The register is designed to provide a unique source of information on the supply and characteristics of the scientific population. At the same time it provides a mechanism for the prompt location of individual scientists with highly specialized qualifications when needed for scientific work in the national interest. Originally considered as the primary purpose of the register, this latter use may be of less importance under present day conditions.

Nine major professional scientific societies—and through them some 200 additional specialized societies—are now cooperating with the Foundation in the maintenance of the register. Each major society serves as the registration agent for the particular disciplines it covers, and provides the Foundation with data on the individual registrations secured. The societies assist in the development of the classification of scientific specialities to reflect current status of technological advance.

The Foundation establishes minimum operating standards, develops uniform procedures and schedules, and provides a major share of the funds required through contracts with these societies. Punchcards are used for the maintenance and storage of data, and copies of register questionnaires are reproduced on microfilm thereby assuring easy reference and flexibility. An arrangement has been concluded with the U.S. Public Health Service whereby it maintains a register of sanitary engineers as a part of the overall register.

A recent development is the joint establishment with the Civil Service Commission of a roster of Federal scientists and engineers. This roster is designed to service the Government's own personnel program, by making known the skills and qualifications of Government scientists in connection with upgrading and personnel transfers. All the details of management of this roster have not been completed, but it is hoped that a single data collection will serve both agencies.

The register is a comprehensive program for registration of scientific personnel. It covers the natural sciences and certain related disciplines such as geog-

raphy and demography. In the science fields, it aims to include all sicentists trained to the doctor of philosophy degree level or with equivalent training and experience sufficient to qualify them as full-fledged professionals in their respective fields. In the engineering fields a finder's list, which includes some 20,000 engineers selected to represent different geographical areas and engineering specializations, was maintained. These key engineers have agreed to supply advice on technical matters or names of other engineers with special talents, skills, or training, in case of emergency. This list was primarily conceived as serving the emergency location function of the register.

At the present time there are approximately 170,000 scientists registered in the program with data collected in 1957 or 1958 An additional 20,000 engineers are included in the finder's list. The total number of natural scientists is in the neighborhood of 300,000, with perhaps 250,000 eligible for registration under present standards. There are probably as many as 800,000 to 850,000 engineers at the present time.

Present plans call for recircularization and some expansion of register coverage in 1960. It is anticipated that about 250,000 scientists will be registered, including some in newer fields of applied science. Some important segments of engineering sciences will be covered. Altogether, the total coverage in 1960 is expected to approach 400,000 scientists and engineers.

The register program has the expert assistance and continuing advice of the Advisory Committee on Scientific Manpower Information. This committee was organized in 1953 to provide advice on important policy and procedural matters to the Foundation through the scientific manpower program. Its membership includes well-qualified authorities on scientific manpower matters, and is drawn from other Government agencies, profesisonal and scientific societies, industry, and educational institutions. Listed below is the present membership:

Dr. Philip N. Powers (chairman), Internuclear Co.
Dr. James W. Cole, Jr., University of Virginia.
Mr. Harold Goldstein, Department of Labor.
Mr. Albert Kay, Department of Defense.
Mr. Charles V. Kidd, National Institutes of Health.
Mr. Ray W. Mayhew, Owens-Illinois Glass Co.
Mr. James C. O'Brien, Department of Health, Education, and Welfare.
Dr. M. H. Trytten, National Research Council.
Dr. J. Fletcher Wellemeyer, private consultant.
Dr. Dael Wolfle, American Association for the Advancement of Science.

Executive officers of the scientific societies cooperating in the register program are similarly called upon to act in an advisory capacity as the need arises.

Register program costs—that is, expenditures for support of the registration activities of the professional societies and the records center operations—have averaged about $200,000 per year over recent years. In fiscal year 1957, costs totaled $209,000 and in fiscal 1958, $139,000. Expenditures were sharply increased in fiscal 1959, however, and are estimated at approximately $380,000.

REVIEW OF REGISTER PROGRAM IN 1958

The Foundation, in keeping with what it considers good operating practice, reviewed the register program as a going concern in 1958. A special advisory panel, chaired by Dr. Wolfle, then executive officer of the American Association for the Advancement of Science, and including representatives of industry, the scientific societies, and Government agencies was requested to review the operation and make appropriate recommendations. This panel approved the general objectives of the program. However, it strongly urged that all reasonable efforts be devoted to faster processing and availability of register information even at the loss of some detail and completeness of coverage. It urged that there be no extension of coverage to additional fields of science until information on present coverage was made more current.

Uses of the register for the location of critical scientific and technical specializations under emergency conditions have been reviewed. Such uses would be for the most part under the direction of other agencies with responsibility for recruitment, utilization, and placement of critical manpower. Accordingly, the Foundation requested the Office of Civil and Defense Mobilization on May 4, 1959, to clarify its responsibilities for this function. OCDM instructions in this regard are expected to be extremely helpful to the Foundation in determining the direction of the register program.

Progress is being made on the question of extension of coverage to selected engineering fields. A study contract is being made with the Engineers Joint Council for a review of the present finder's list registration of engineers. The council will be expected to review the present operation, determine its adequacy in terms of the needs for information of a register type on engineers, and, based upon these findings, recommend what further improvements should be made.

USES OF REGISTER INFORMATION

The register materials have served a number of purposes. For example, in addition to the summary data provided by it, there have been numerous requests for information on individuals and small groups. The foundation does not operate a placement service but it has located scientists with specialized qualifications where it was found in the Government's interest to do so. Such searches have included locating of individuals with Russian language competence for use in connection with foreign science exchange missions and translation services. Salary data for scientists in the register have been made available in summary form to the Civil Service Commission in connection with the Government's review of its own salary schedules. Numbers of scientists in small highly specialized fields are made available from time to time for research program planning purposes. The register program normally participates in the annual Operation Alert exercises directed by the Office of Civil and Defense Mobilization.

The finders' list operated by the Engineers Joint Council has been less used. Since it is not designed to provide data on the characteristics of engineering personnel, its use is confined to location of individuals. It has been used on a few occasions to locate individuals for consulting purposes on special Government programs.

RELATION TO OTHER SCIENTIFIC MANPOWER INFORMATION

The register affords an excellent technique for collection of data on characteristics of the scientific personnel supply. By going directly to the individual scientists, it is able to get information on scientific specializations with a refinement quite impossible in surveys of households of the census type or of employing establishments. Use of professional societies as the collection agents has similar unique advantages. The scientific membership societies are the scientists' own agencies; they are in close touch with them; they are quick to detect new trends and emerging specializations; and they maintain contact with them for their own professional reasons. Furthermore, the societies are in a favorable position to recruit scientists to review and advise on classification practices.

At the same time, it should be noted that register data require supplementation in important respects for a well-rounded program. The main additional ingredient in an integrated program is information on the demand for scientists and engineers. Such information must be collected through other techniques including the study of employing establishments, development of relationships between measures of scientific and economic advance, comparisons with other types of employment, etc. In the program for national information on scientific and technical personnel some 15 areas were cited as important for early action. Further development of register data will be extremely useful in meeting some of these needs. Others must be met in other ways.

CONCLUSION

The Foundation is aware of the need for current and adequate information on the Nation's scientific and technical manpower. It recognizes the importance of the register as a source of information on this subject.

It has explored the problems relating to a register with the assistance and advice of highly qualified representatives of the scientific societies, other Government agencies, and industry. It will be glad to share its knowledge and cooperate with the committee in whatever way it can.

[National Science Foundation—Press release, July 6, 1959]

FOUNDATION ACCEPTS RESPONSIBILITY FOR PROGRAM OF NATIONAL DATA ON SCIENTIFIC AND TECHNICAL PERSONNEL

The National Science Foundation, an independent agency of the U.S. Government, announced today that at the request of the Bureau of the Budget it is accepting leadership in behalf of interested Federal agencies for establishing and maintaining a program of national information on scientific and technical personnel.

The Bureau recently circularized several interested Government agencies to learn their views as to the importance of adequate statistical information on scientific personnel; their training and utilization, compensation levels, supply and demand, and other related data. Agencies were asked to comment on the report of the Foundation, "A Program for National Information on Scientific and Technical Personnel." As a result of the agencies' replies, the Bureau asked the Foundation to take responsibility for a Federal program in this area "so that a coherent body of timely information can be built up on the supply, demand, and utilization of scientists and technical personnel."

The Bureau noted that "leadership in planning, coordinating, and analyzing information on scientific and technical personnel—and for assuring that the findings will be made public—would come from the National Science Foundation. In exercising these responsibilities, the Foundation should use the facilities of other Federal statistical agencies, where appropriate, to the fullest extent possible.

"Much of the information recommended will be produced by extending existing statistical series to identify scientists and engineers or to add items of information. Other projects will have to be initiated to meet the objectives of the program, but questions of coverage, timing, definitions, etc., should be considered in relation to the program as a whole. Existing statistical activities of a number of Government agencies are involved, especially those in the Departments of Commerce, Labor and Health, Education, and Welfare."

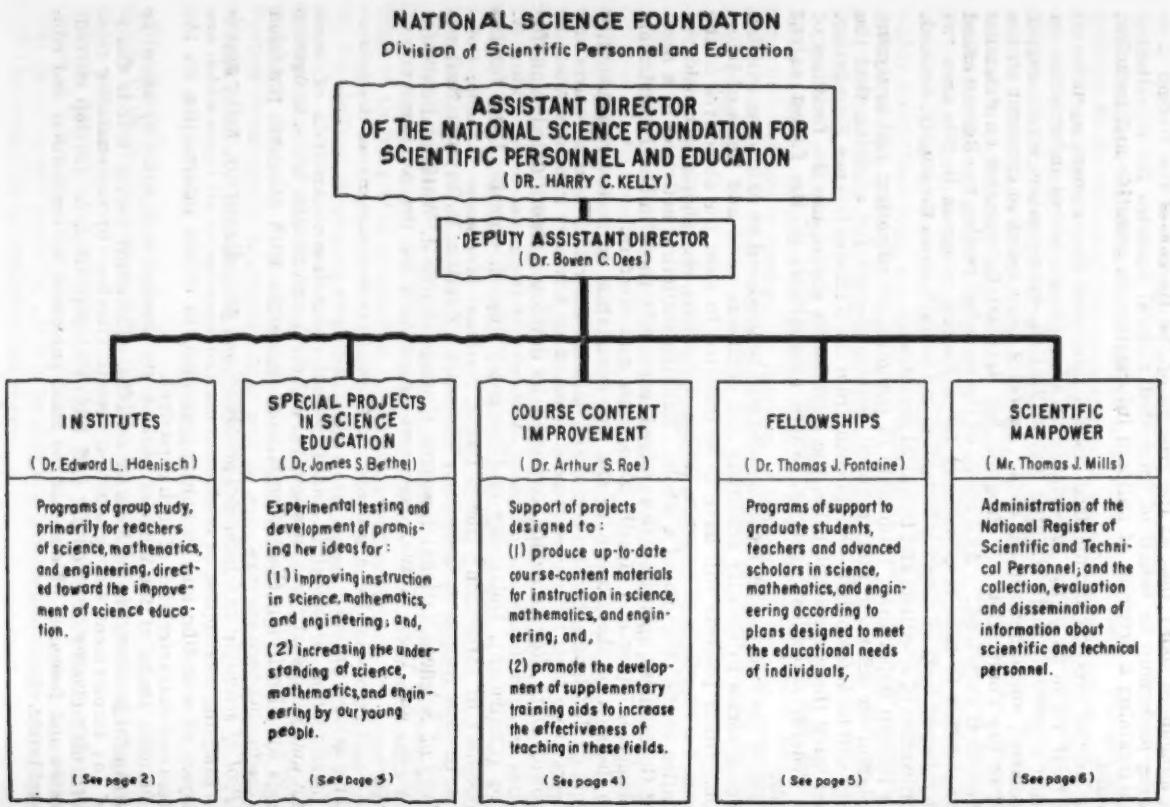
The decision of the Bureau to ask the Foundation to accept responsibility for guiding development of a program of national information on scientists and engineers arose from recent recommendations of an Advisory Panel on Scientific Manpower Data Requirements, convened to develop a coordinated plan for statistics on scientists and engineers. Members of the panel were: Philip M. Hauser (Chairman), University of Chicago; Philip H. Coombs, Fund for the Advancement of Education; Henry David, National Manpower Council; Coleman R. Griffith, American Council on Education; Merriam H. Trytten, National Academy of Sciences-National Research Council; Ralph J. Watkins, Brookings Institution; and Dael Wolfle, American Association for the Advancement of Science.

The panel recommended a program of 15 projects and designated the following three as most urgent:

1. *Identification of scientific and technical occupations.*—Analysis of work content and job descriptions in scientific, technical, and related fields, to develop methods for identifying these occupational categories with adequate precision when conducting such surveys.

2. *Pool of scientific and technical personnel.*—A periodic survey, using appropriate sampling techniques, of organizations and agencies of all types which are employers of scientific and technical personnel, to obtain information on the numbers and characteristics of such personnel.

3. *Periodic study of the demand outlook for various categories of scientific and technical personnel in each major activity.*—The study would include analysis of (*a*) employment and production growth trends; (*b*) the changing roles of particular classes of scientific and technical personnel, to develop current estimates and forecasts of demand for such personnel by occupation and educational levels.


NATIONAL SCIENCE FOUNDATION
Division of Scientific Personnel and Education
ASSISTANT DIRECTOR OF THE NATIONAL SCIENCE FOUNDATION FOR SCIENTIFIC PERSONNEL AND EDUCATION
(DR. HARRY C. KELLY)
DEPUTY ASSISTANT DIRECTOR
(Dr. Bowen C. Dees)
INSTITUTES
(Dr. Edward L. Haenisch)
Programs of group study, primarily for teachers of science, mathematics, and engineering, directed toward the improvement of science education.
(See page 2)
SPECIAL PROJECTS IN SCIENCE EDUCATION
(Dr. James S. Bethel)
Experimental testing and development of promising new ideas for :
(1) improving instruction in science, mathematics, and engineering; and,
(2) increasing the understanding of science, mathematics, and engineering by our young people.
(See page 3)
COURSE CONTENT IMPROVEMENT
(Dr. Arthur S. Roe)
Support of projects designed to :
(1) produce up-to-date course-content materials for instruction in science, mathematics, and engineering; and,
(2) promote the development of supplementary training aids to increase the effectiveness of teaching in these fields.
(See page 4)
FELLOWSHIPS
(Dr. Thomas J. Fontaine)
Programs of support to graduate students, teachers and advanced scholars in science, mathematics, and engineering according to plans designed to meet the educational needs of individuals,
(See page 5)
SCIENTIFIC MANPOWER
(Mr. Thomas J. Mills)
Administration of the National Register of Scientific and Technical Personnel; and the collection, evaluation and dissemination of information about scientific and technical personnel.
(See page 6)

SOVIET SCIENTIFIC MANPOWER AND TECHNICAL INFORMATION DATA

[From Information Bulletin, vol. III, No. 10, October 1958, Air Information Division, Library of Congess]

Utilization of Qualified Technical Manpower in U.S.S.R. Industries

Moscow Oblast' Sovnarkhoz organized in November 1957 a conference on qualified technical manpower. The conference was held in Moscow and was attended by some 400 industrial enterprises executives and leading engineers-technicians.[1]

The following facts were revealed and discussed by the participants.

Fifty-nine thousand specialists are employed in the various enterprises of Sovnarkhozes. In some branches, the percentage of qualified technical workers is high. Thus, in the chemical industry, 80 percent of engineering-technical personnel possess diplomas in their specialties. But there is an acute shortage of specialists in a number of other branches, notably in textiles and woodworking industry. Even a number of foremen are insufficiently competent for directing production processes.

Thus, at Yegor'yevsk Shoe Manufacture, 82 percent of foremen have no technical education in the field.

The cause of the shortage is not lack of specialists available, but a suspicious and reluctant attitude of the management toward "greenhorns" graduating with diplomas from VUZes. Frequently, engineering-technical posts are occupied by little-qualified personnel, while specialists serve without any special assignment, as jack-of-all-trades.

Or else, young diploma bearers are appointed as "acting" this-or-that, which undermines their self-assurance and self-confidence and deprives them of initiative.

At Podol'sk Machine-Building Works, out of 122 young specialists, only 11 work in the shops (not 1 out of the 22 of class 1955).

One of the major shortcomings is lack of planning for needs in specialists-economists.

Year after year, requirements in economic engineers and technicians are lowered in the enterprise planning. This is due to underestimation of their usefulness, and as a result, there is a constant shortage of engineers-economists.

The shortage is compounded by the excessively broad programs of their education. *Before he can be given a specific job, the young engineer-economist must* be given additional specialized education.

As a consequence of errors in *planning for young specialists employment, ab*normal situations exist in some enterprises, where there are as many specialists with secondary technical education as with the higher one, or even less.

As an average, in all enterprises of Moscow Oblast' Sovnarkhoz there is 1 engineer for 1.25 technicians. In the metallurgical enterprise the ratio is 1:1 and *in Podol'sk Heavy Metallurgy Works there is 1 technician for 3* engineers.

The low level of practical training of enginers and technologists is another serious problem.

Recommendations were made at the conference that practical work be accomplished by the students at the very enterprises where they will be assigned and their graduation work be connected with the character of those enterprises.

It was also recommended that the young graduating engineers accomplish *a practical training period and it was pointed out by* some industry executives that this is the actual practice in industry anyway.

It was also stressed that in enterprises which take care of their young specialists and help them in revealing and developing their capabilities and aptitudes, no serious mistakes are made in the assignments.

At Kolomna Thermo-Locomotive Construction Works, in 1956–57 only, some 59 young specialists were given leading jobs. At Podol'sk Mechanical Works young specalists are actively associated in rationalization activities. In the last 2 years they made 350 proposals which were directly introduced in production.

The defective distribution of specialists appears in that the enterprises are usually well supplied in specialists in their main field, but not in connected and supporting specialities. Thus, the textile plants of Moscow area have

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[1] Industry Representatives Speak Up," account of the conference, author not given, Vestnik Vysshey Shkoly No. 1, 1958, pp. 18–21.

enough textile engineers but are in acute need of thermotechnical, building, electrical, and mechanical engineers.

Plant laboratories are poorly provided with qualified personnel. Lubertsy Works imeni Ukhtomskiy has but 10 employees in its laboratory, which is but a small part of its requirements. Out of 40 employees of Glukhov Cotton Kombinat, there are only 3 engineers and 5 technicians. The others have no special technical education.

ALL-UNION POPULATION CENSUS[2]

An all-Union population census will be carried out in January 1959.

The census operations will be effected by special recorders in an 8-day period, from January 15 to 22, 1959, and the registration will be considered as of Thursday, January 15.

A verification of the accuracy of the census will be carried out by instructors-supervisors in a 10-day period, from January 23 to February 1, by a complete door-to-door survey.

In the regions of the Far North and in some other areas of difficult accessibility, the census will be accomplished earlier.

U.S.S.R. Council of Ministers gave its approval to the form proposed for the census.

The answers to the questions of the questionnaire form will be registered without documentary verification.

Schoolworkers, teaching personnel, students of institutions of higher education and technicums senior courses, personnel of establishments and enterprises, sovnarkhozes, MTS, RTS, Kolkhozes, and other organizations will be employed for the operations of the census and excused from their regular work during those operations.

P. Pod''yachiy discusses in Planovoye Khozyaystvo the organization of the census and its significance.[3]

The importance of accurate and detailed population statistics is very great in a socialistic economic system. They are necessary for correct economic planning for the utilization of the state's natural resources and production capacities, and of the available manpower.

Every division, section and paragraph of state economic plans are based on data on the population.

The forthcoming 1959 census is the fourth undertaken by the Soviet Government. The previous ones were organized respectively in 1920, 1926, and 1939. The 1926 census was extensively used in the national economic planning. However, the war prevented the utilization of the findings of the 1939 census.

After the severe losses in population and material wealth caused by World War II, and under the constant betterment of working conditions and increase of the people's well-being, there was a considerable decrease in mortality and lengthening of the average lifespan. As compared to 1940 figures, mortality decreased in 1956 by 240 percent, infantile mortality by 400 percent. U.S.S.R.'s birthrate is higher than in the United States, France, Germany, or Great Britain and mortality is lower than in most of the capitalist countries.

The annual increase in U.S.S.R. population for the last several years was higher than in 1940, at over 5 million people a year.

The census will supply data necessary for the work of Government and economic administrations, planning agencies, and scientific organizations. The text of the questionnaire will supply answers of capital importance for the detailed characterization of U.S.S.R. population.

Particularly important will be the exact figures of population in every locality, Oblast', Economic-Administrative Region, etc., in view of housing, production and distribution planning, construction and equipment planning for schools and hospitals, health personnel per 1,000 inhabitants, etc. Of course, it is equally necessary for the same purpose to procure specific breakdowns in sex, age group, education, and occupation.

Sex, age group, and the distinction between urban and rural population are also important for the planning for the distribution of consumers goods.

The 1939 census revealed that the age group 1 to 29 represented 63 percent of the population which is a very large percentage as compared to the capitalist countries where this group seldom exceeds 50 percent.

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[2] Editorial, Vestnik Statistiki No. 5, 1958, pp. 13–14.
[3] "All-Union Population Census," Planovoye Khozyaystvo No. 2, 1958, pp. 61–72.

In 1939, U.S.S.R. population comprized 81,700,000 males and 88,900,000 females.

The chapter of the questionnaire dealing with the national status will permit to determine not only the nationality but also citizenship and language; 100 nationalities will be considered in the census, including foreign national residings in U.S.S.R.

For each nationality of the Union, there will be a breakdown in urban and rural population, sex, age, education, profession, social group, family status.

Already in 1939, literacy reached 81.2 percent and has certainly increased since.

Equally in 1939, there were 14,300,000 people with secondary and higher education and this figure also increased substantially since.

The analysis of data on location of work, occupation, and other sources of livelihood will supply information on the distribution of the population among the sectors of national economy, branches and types of production, the breakdown going as far as the level of specific enterprises designated by their names.

"The distribution of the population among social groups will characterize the class structure of Soviet society."

As regards the industrial occupation, the collected data will permit to determine the number and size of professional groups, industrywise, while for the agriculture, only types of enterprises will be established.

Data will be distributed according to the following classification:

1. Persons engaged in productive occupation procuring a salary or any other income.
2. Persons employed in auxiliary agricultural economy of kolkhozes, workers and employees.
3. Pensioners and stipendiaries of Government, cooperatives, and public organizations.
4. Dependents of private persons.

Persons living on income other than provided by work will no longer be accounted for separately since this group is rapidly dwindling. Already in 1939, there were only 61,000 people left in that category.

Those engaged in useful occupations will be classified into manual workers and employees, and within those two groups into several dozens of production branches and professional categories such as miners, metalworkers, constructors, railroad and water transport workes, food, textile, chemical wokers, tanners, etc.

Among the employees, there will be groups like executives, technicians, planning and supervision personnel, medical workers, cultural-political-educational workers, workers in arts.

Each group will be subdivided into the main professions. Thus, the metalworkers will be classified into tool workers, mechanics, fitters, machinists, welders, blacksmiths and toolsmiths, pressers, punchers, steelworkers, stokers, etc.

In the medical profession will be listed separately physicians, medical assistants, midwives, nurses, kindergarten educational personnel, etc.

"Information thus collected will be used for further betterment of production and administration organization in every branch of national economy, determination of utilized and nonutilized manpower, planning for, and training of, specialists and personnel of mass professions."

Simultaneously, will be established the class composition of the population: workers, employees, kolkhoz workers, "cooperated" and "noncooperated" craftsmen, individual peasants ("yedinolichnik"), members of liberal professions, servants of religious denominations.

Six hundred thousand people will be employed in the operations of the census.

ORGANIZATION AND DIFFUSION OF SCIENTIFIC-TECHNICAL INFORMATION IN U.S.S.R.

The Soviet Government attaches a considerable importance to diffusion of scientific and technical information among industrial enterprises administrations and technical personnel, plant "novators" and "rationalizers" (technical employees, whatever the position, who take the intiative of proposing improvements in production methods, equipment, operations, etc.), scientific and industrial research personnel, etc.

There exists a network of scientific-technical information agencies, headed by the State Council of Scientific-Technical Information operated jointly by the Academy of Sciences and U.S.S.R. Gosplan under the responsibility of the former.

However, there seems to be insufficient contact and cooperation among the various information organs. At the same time, little use is made of the information made available to enterprises.

The problem is discussed by V. Kuz'min, Chief of TsBTI (Central Office of Technical Information) of Yaroslavl' Sovnarkhoz.[4]

According to Kuz'min, the reorganization of economic administration demanded a radical improvement in the preparation and dissemination of scientific-technical information, since the decentralization in this administration, "bringing it closer to the workers masses," opened new possibilities for the exercise of individual creative initiative. At this time, however, there are the following major defects in the organization of scientific-technical information: tardy reception of information; its inappropriateness to the current problems of national production; little practical value of the experience included in information material.

At each Sovnarkhoz was created a TsBTI whose task it is to disseminate the experiences of novators, organize interbranch information exchanges within the economic regions, publish catalogs, standard shipment documents, etc.

Sovnarkhozes and enterprises expect from TsBTI's and information institutes a thorough investigation of every aspect of technical developments in the given branch of national production, and comparative analysis of such developments in the given economic region.

Unfortunately, writes the author, few central organs of information deal at this time with such comprehensive studies. For instance, during the period of preparation of prospective plans for 1959–65, Yaroslavl' Sovnarkhoz received from them no branch surveys of national and foreign technology.

Besides the comparative analyses, the central organs, writes Kuz'min, should regularly and timely supply the Sovnarkhozes with data concerning technical novelties, both national and foreign, and answer queries on questions which were not adequately handled in the press and periodicals. For example, Yaroslavl' Sovnarkhoz needed to compare the weight and power of electric motors and diesels manufactured in the region to those produced in other regions. However, neither the TsBTI of Electric Industry, nor those of NATI (Automobile and Tractor Scientific Research Institute) and NAMI (State All-Union "Order of Labor Red Banner" Automobile and Automobile Engine Scientific Research Institute) were able to answer the question.

In 1958, the central organs of information will issue 50,000 sheets of information material. But they will hardly be used at the enterprises. For example, only 15 percent of Yaroslavl' Sovnarkhoz enterprises have their own study services; few possess technical research laboratories.

Besides, unlike inventions, introduction of better techniques or equipment experimented elsewhere does not entitle the authors to material rewards. This, according to the author, causes frequent attempts to introduce the improvement through BRIZ (Office for the Promotion of Industrial Efficiency and Inventions). This, however, cannot be done when blueprints and designs are received of installations, devices, or machinery already used elsewheer, and in such cases the communication interests nobody and is left unutilized.

Kuz'min recommends legislation on the selection and dissemination of advanced technical experience, and material rewards for those who make use of it.

In an article "Reviewing and Publishing of Foreign Literature,"[5] three prominent Soviet scientists, U.S.S.R. Academicians I. Artobolevskiy and A. Blagonravov, and S. Serensen, member of the Ukrainian Academy of Science, discuss the same question of dissemination of scientific technical information in U.S.S.R., giving a special attention to the problem of dissemination of foreign scientific and technical information among the Soviet technicians. They remind that a decision of the July 1955 Plenary Session of the Central Committee, CP U.S.S.R. obligated various scientific institutions, notably the U.S.S.R. Academy of Sciences, ministries, and other agencies "to improve scientific-technical information, develop contacts with foreign scientific research organizations and exchange of scientific and technical information, and increase the purchase of foreign books."

The authors state that in the latest years, scientific-technical information greatly improved in U.S.S.R. The Academy of Sciences and the State Scientific-Technical Committee jointly created the Institute of Scientific and Technical Information which issues reference journals. A number of libraries and ad-

[4] "The Interest of the Work Demands This," Promyshlenno-ekonomicheskaya gazetta No. 67, June 4, 1958, p. 3.
[5] Promyshlenno-ekonomicheskaya gazeta No. 63, May 23, 1958, p. 4.

ministrations publish bibliographic bulletins containing information on domestic and foreign scientific literature.

Purchase of foreign books was increased. The State Library imeni Lenin receives 400,000 foreign books annually, and so does the All-Union State Library. The Academy of Sciences Fundamental Library receives about 30,000, the State Scientific Library about 4,500.

But it is most important, they continue, to give the potential readers a preliminary information on the content and significance of books. Unfortunately, until recently little was done in this respect. Leading libraries published mere lists of accessions. Information contained in U.S.S.R. Academy of Sciences Scientific and Technical Information Institute reference journals was incomplete.

It is not sufficient to mention the content of the book. It also should be specified what is new in it and the book should be compared to similar domestic publications. It is necessary both to point out the books which offer the greatest interest and help broad circles of readers in getting acquainted with them, which demands systematic selection and reviewing.

This, the authors state, was organized now by the Publishing House of Foreign Literature, but not yet on a sufficient scale.

The authors have particularly in mind the systematic selective publication of reviews in precise sciences, technology, agriculture in the publishing house's three series of Foreign Literature Bulletins: "Precise Sciences," "Technology," "Agriculture and Biology." In each of the 12 issues of "Technology Bulletin" of 1957 appeared, as a rule, about 60 foreign books reviews, while 700 foreign books on various technical subjects were reviewed both in 1956 and in 1957; 110 on mechanology and machine building, 98 on electronics, 92 on metallurgy, 61 on building and architecture, 40 on mining, 37 on electrotechnics, etc.

According to the authors, the reviews contain analyses of the books, discussion of their questionable points and erroneous statements, and critical comparisons to domestic literature dealing with the same problems. The reviews are written by leading scientists and industrial technology specialists; however, not all of them are extensive and complete enough.

Out of the 700 foreign books reviewed in 1957, 367 were recommended for translation. Nevertheless, not more than 25 to 30 percent of these were translated and published in Russian.

Some other publishing houses are mentioned by the authors with approval, notably Metallurgizdat, Oborongiz, Energoizdat, for doing their best in publishing in Russian significant foreign books. Others however are, they say, most neglectful in this respect. Thus, the 596 publications of Mashgiz in 1957 comprised only 6 translations.

Reminding that the Soviet Government spends considerable sums annually for the purchase of foreign books, the authors recommend that these expenses be justified by their rational utilization through a constant perfecting of information, namely speedy publication of translations and a better diffusion of references by libraries.

It is significant that this question is discussed by outstanding scientific personalities. The figures they give are impressive and the fact that, according to the authors, reviews of foreign scientific books are made by leading Soviet scientists is revealing of the attention given by the Soviet State to scientific and technical progress abroad.

[From Information Bulletin, vol. IV, No. 7, July 1959, Air Information Division, Library of Congress]

The U.S.S.R. Academy of Sciences Has a New Constitution

The General Assembly of the U.S.S.R. Academy of Sciences went through the motions of discussing, approving, and enacting its new constitution, which replaces the 1935 one.[6]

According to the introduction to its publication, the changes were necessitated by the considerable development of the institution since the promulgation of the previous constitution. Between 1935 and 1958, the Government financial appropriations for the Academy increased 32-fold. The number of its scientific

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[6] Vestnik Adademii nauk SSR No. 5, 1959, pp. 3–17.

institutions tripled, its personnel increased ninefold. At this time, the Academy comprises 518 academicians and corresponding members, 1,466 doctors, and 6,788 candidates.

The new constitution aims at further increasing the role of the Academy as the highest national scientific institution and scientific agency of the state, guiding and coordinating all the scientific activities in the Union.[7]

It is the task of the Academy to "prepare and submit for approval to the U.S.S.R. Council of Ministers preliminary plans for the working out of the main scientific problems having the greatest theoretical and practical importance for the U.S.S.R." The Academy is to assist in the coordination of scientific work carried out in the U.S.S.R. Its findings are to be submitted to the U.S.S.R. Council of Ministers, together with its proposals concerning the organization of scientific work in the US.S.R.

The nature of the contribution of the Academy to the economic development of the Union is detailed in section 4 of the constitution.

The Academy must—

(*a*) concentrate its work on the leading scientific problems;

(*b*) study the natural resources and productive forces of the nation * * *;

(*c*) cooperate in the timely and rational utilization of scientific, technical and cultural achievements of mankind in the practice of communism building in the U.S.S.R.;

(*d*) supply scientific consultations and studies ordered by the higher organs of the Government.

Moreover, the Academy must "assist the Academies of Sciences of the Union Republics in the conduct of scientific research and coordinate their work on the most important scientific problems; establish and develop scientific ties with the UR Academies of Sciences, specialized Academies,[8] scientific research institutes, institutions of higher education, scientific societies, and other scientific organizations which carry out scientific research work" (sec. 9).

The close subordination of the Academy to the Government is further ascertained in section 5: "The U.S.S.R. Academy of Sciences and its institutions carry out their work under a plan prepared by the Academy on the basis of directives issued by the U.S.S.R. Council of Ministers * * *. The plan of (its) most important scientific research work is to be approved by the U.S.S.R. Council of Ministers."

The constitution endeavors to provide for a better liaison between the Academy on the one hand, and the other Soviet scientific institutions, industrial, agricultural, and other economic organizations, and the institutions of higher education on the other hand, as well as with the "practice of building communism." In particular, it defines the composition, tasks and functions of the newly created Siberian Branch of the Academy, in the light of the plans for the speedy development of the economy of Siberia and the Far East, to which the Siberian Branch is called upon to dedicate its activities. The branch, which comprises all the academicians and corresponding members working in the scientific institutions of Siberia and the Far East, whatever their specialty (instead of belonging to the department of their specialty), has authority over all the subsidiaries of the Academy located in the area.

It is significant of the extreme importance attached by the Soviet Government to the speedy and complete economic development of Siberia that a special chapter of the constitution (ch. 8), is devoted to the organization and operations of the Siberian Branch. It specifies in particular (sec. 53) the authority of the RSFSR Council of Ministers over the branches. The latter's proposals for the creation of new scientific institutions in its framework must obtain the agreement of the former before being submitted to the decision of the Academy's Presidium, to which section 55 adds bluntly, "The Siberian Branch is subordinated to the Presidium of the U.S.S.R. Academy of Sciences and the RSFSR Council of Ministers." Likewise (sec. 56), the annual plan for the operations of the Branch must be ratified by the Presidium of the Academy by agreement with the RSFSR Council of Ministers. The annual reports of the Branch must

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[7] A general remark must be made concerning the terms "science," "scientific personnel," "scientific research institutes," etc. In Russian, and consequently in the practice of Soviet administration, in Soviet publications and statistics, by "science" is understood any branch of knowledge; by "scientific worker" or "scientist," any specialist in any of those branches endowed with academic degrees, be they exact sciences, liberal arts, sociology, and political science, and even arts.

[8] There are four such Academies: Agriculture, Architecture, Arts, and Medicine.

be submitted to this Council of Ministers as well as to the Academy Presidium.

The constitution stresses in every way the preeminent character of the Siberian Branch, as compared to the ordinary departments. Thus, the departments are governed by bureaus elected by the respective General Assemblies and comprising an Academician-Secretary, Deputy Academician, Secretaries and Members. The Siberian Branch, however, (sec. 58) is governed by a Presidium, formed of the President of the Branch who must be a Vice President of the Academy itself, a First Deputy President who must be a member of the Academy Presidium, Deputy-Presidents, a Chief Learned Secretary and members. The President of the Branch and the First Deputy-President are elected by the General Assembly of the Academy itself, the other members of the Presidium, by the Branch General Assembly, subject to confirmation by the Academy Presidium. Moreover, the Branch is endowed with a "constitution," while the departments have "regulations."

The more exalted position given the Presidium of the Branch over the department bureaus has more than mere moral or psychological effects. The higher ranks of the main Branch Presidium dignitaries involve higher salaries and larger fringe benefits, notably in housing and transportation facilities. The obvious purpose of this preferential treatment is to attract to Siberia skilled scientists.[9]

The statuatory composition of the U.S.S.R. Academy of Sciences suffered a notable change: the honorary membership was abolished in the new constitution, which permitted stripping Molotov of this distinction. He was the single honorary member of the Academy since the death of Generalissimo Stalin.

The new constitution enforces the principle that the Academy is not a glorified rest home for retired scientists, but a workshop. "The main task of every Academician and Corresponding Member is to constantly enrich science with new achievements and discoveries through personally executed scientific research and investigations, organization of collective working out of leading scientific problems and scientific guidance of this working out" (sec. 30).

The more clearly specified duties and responsibilities of the membership are more explicitly sanctioned in the new constitution. The annual accounts of the members' activities are to be examined not only by the leading organ of the Academy and those of its departments, but also by the learned councils of the Institutes concerned (sec. 32).

The complete loyalty and submissiveness of the membership to the Soviet State is secured by a very effective whip accompanying the various carrots offered to the scientists by the Government. Under section 33 of the constitution, "The Academicians and Corresponding Members of the Academy can be deprived of their titles by decision of the General Assembly if their activities are detrimental to the interests of the Soviet Union." One need not doubt the readiness of the General Assembly to vote any exclusion at a nod of the Academy's bosses.

DISSEMINATION OF SCIENTIFIC-TECHNICAL INFORMATION IN THE U.S.S.R.

A recent article in a Russian economic publication[10] leveled heavy criticism at the system of dissemination of scientific-technical information in the U.S.S.R. It stresses the lack of coordination in gathering the material, useless duplication of articles in some fields, gaps in others, and a lack of method in general.

Similar complaints were already formulated earlier by leading scientists about the poorly organized scientific-technical information setup.[11]

It was one of the purposes of the establishment of the State Scientific Technical Committee (GNTK) in the spring of 1958 to have it organize and supervise the coordination of scientific-technical information. One year later, however, complaints were still being voiced.

The dissemination of information is carried out through some 127 scientific-technical and industrial publications. Scientific-technical publishing houses, the central organs of scientific-technical information, and the corresponding organs of the Union Republics, sovnarkhozes, scientific research societies, etc., participate in these operations.

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[9] The Siberian Branch of the U.S.S.R. Academy of Sciences is discussed in the Information Bulletins No. 2, 1958, pp. 5–9; No. 3, 1958, p. 7; No. 3, 1959, p. 26.

[10] "Measures for the Improvement in Scientific-technical Information," an unsigned article, Promyshlenno-ekonomicheskaya gazeta, May 20, 1959, pp. 2–4.

[11] Information Bulletin, October 1958, p. 29.

But the author states that, due to the lack of coordination among the numerous organs of technical information, the same information is published in a number of publications. In particular, the "Offices of Technical Information" of many of the sovnarkhozes indulge in unnecessarily extending publishing activities, frequently duplicating information disseminated by the central organs.

Eighty-nine sovnarkhozes publish multibranch bulletins which contain a number of review-type articles concerning various industries. However, since no technician has enough time available for looking for information in his field in 89 bulletins covering many other fields as well, the information contained in the latter does not reach a large audience.

The same reproach is addressed to the information institutes which were created in various Union Republics. Thus, the Azerbaidzhan Institute of Technical Information reprints articles published in other information organs.

While there is only one textile enterprise in the Republic, the Institute prints 2,000 copies of information material on the textile industry issued by the Office of Technical Information of Light Industry. This material is available to anybody by subscription and there is no cause for reprinting it.

VINITI (All-Union Institute of Scientific and Technical Information, or Vsesoyuznyy Institut Nauchnoy i Tekhnicheskoy Informatsi) is accused of excessive delays in the preparation and publication of reference journals and "express information."

Criticism is also leveled at scientific-technical and industrial-technical periodicals. They are accused of giving inadequate coverage to essential scientific and economic problems. Catalogs and industrial prospectuses are printed in absolutely insufficient quantities, which complicates the work of scientific research institutes and design bureaus. In order to get information, they must send representatives directly to enterprises.

Another shortcoming is seen in the lack of coordination in the translation of scientific-technical literature which causes parallelism, dispersion of forces, and waste of money. The example is given of the institutes and enterprises of the Ukrainian S.S.R. which employ altogether 2,000 translators, each of them translating not more than three to four printed pages a year.

In view of these shortcomings, important decisions were made recently.

Coordination and methodical guidance of the operations of scientific-technical information were divided, on the national level, between two organs: the GNTK and the State Committee of the U.S.S.R. Council of Ministers on Building; and, on the UR level, among the corresponding scientific-technical and building committees or associations.

Thirteen central institutes and offices of technical information were transferred from the Gosplan to the GNTK. These organizations will serve as bases for the creation of enlarged central branch-institutes of scientific-technical information.

The GNTK and the U.S.S.R. Academy of Sciences were put in charge of eliminating the defects existing in VINITI. Starting in 1960, they will have to insure the publication of reference journals in separate issues for various branches of science and technology, with a time lag not exceeding 2 months, and "express information" within 10 days after its reception for reference.

The publishers of all scientific, scientific-technical and industrial-technical periodicals were obligated to communicate to VINITI the summary of each issue not later than 10 days after the imprimatur.

The GNTK, the State Committee of the U.S.S.R. Council of Ministers on Building, and the U.S.S.R. Academy of Sciences were put in charge of working out, jointly with the organizations concerned, proposals for a normalization of translations from foreign scientific-technical literature, both in terms of quality and promptness.

Sovnarkhozes and ministries were instructed to bring order and method in the preparation of technical and economic data for the catalogs and industrial prospectuses, keeping them up to date.

The publication of catalogs and prospectuses was entrusted to branch scientific-technical publishing houses. A Central Office of Catalogs is created at the GNTK for the coordination of these publications.

SPECIAL PROJECTS SECTION,
AIR INFORMATION DIVISION, LIBRARY OF CONGRESS,
July 1959.

INFORMATION ABOUT THE SYSTEM OF REGISTRATION OF SCIENTIFIC WORKERS IN THE SOVIET UNION

At the beginning of 1959 the number of scientists amounted to 280,000. They were distributed as follows:

(*a*) Enterprises, organizations, and the administrative system..... 10,000
(*b*) Various scientific institutions (U.S.S.R. Academy of Science, UR Academies, industry, construction, agriculture, health, education, etc..... 125,000
(*c*) Institutions of higher education..... 145,000

An exhaustive registration of Soviet scientists is being conducted by the statistical administration. All scientific institutions—U.S.S.R. Academy of Science, UR Academies, industry, construction, agriculture, health, education, etc.—institutions of higher education, and other nonscientific establishments are required each year to send to the Central Statistical Administration, or its branches, all data on the number and composition of scientific workers.

The registration of scientific workers is also carried out by other organizations, for example, by—

(*a*) Ministries and committees of the U.S.S.R. Council of Ministers, such as the Ministry of Higher Education, Health, Culture, etc., and Committees of Defense Technique, Chemical, Aviation Industry, etc.

(*b*) The Planning Committee of the U.S.S.R. Council of Ministers through its branches.

Their registration is not quite comprehensive, although it is conducted on a large scale.

At the end of February 1959, the Scientific Economic Council of the U.S.S.R. Council of Ministers was created. Its task is the coordination of scientific research throughout the U.S.S.R. The Scientific Economic Council also will carry out the registration of all the scientific workers in the Soviet Union.

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UNIVERSITY OF MICHIGAN
MAY 1 3 1959
MAIN READING ROOM

[No. 1]

FULL COMMITTEE CONSIDERATION OF H.R. 4913 WITH RESPECT TO AUTHORIZING THE LEASING OF BUILDINGS IN THE DISTRICT OF COLUMBIA BY THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C., Thursday, February 26, 1959.

The committee met at 10 a.m., in the caucus room, Old House Office Building, Hon. Overton Brooks (chairman of the committee) presiding.

The CHAIRMAN. The committee will come to order.

It is a little bit difficult when moving around from place to place in holding hearings, to get started on time. I want to report that we are making progress in reference to our committee room, and also we have been able to obtain some additional space for the staff adjoining the present quarters for the staff. That space is available to us now. It is not as convenient as we would like to have it, but it is space, and the committee room ought to be ready, I would say in another week or 10 days. As soon as it is ready, we will have these meetings in the regular committee room.

Until then I will ask the members to bear with the staff and with the chairman, too, in his efforts to hold hearings first one place and then another.

This morning we have our first bill before this committee. This is H.R. 4913. Does anybody not have a copy of H.R. 4913?

(The bill is as follows:)

[H.R. 4913, 86th Cong., 1st sess.]

A BILL To amend the National Aeronautics and Space Act of 1958 to authorize the National Aeronautics and Space Administration to lease buildings in the District of Columbia for its use

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 203(b)(3) of the National Aeronautics and Space Act of 1958 is amended by inserting after "or any interest therein" the following "(including buildings or parts of buildings in the District of Columbia acquired for the use of the Administration under leases for periods not exceeding ten years)."

The CHAIRMAN. We have also as a witness this morning, Dr. Hugh L. Dryden, Deputy Administrator of the NASA.

Doctor, we are pleased to have you here with us again.

You have a short statement. If you will proceed with it, we will appreciate it.

STATEMENT OF DR. HUGH L. DRYDEN, DEPUTY ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, ACCOMPANIED BY A. S. HODGSON, DIRECTOR OF MANAGEMENT ANALYSIS, NASA; RALPH ULMER, BUDGET OFFICER, NASA; AND ROBERT G. NUNN, JR., COUNSEL, NASA

Dr. DRYDEN. Mr. Chairman, I gather from your opening remarks that the committee has problems with the ordinary type of space and it is the same sort of problem that I wish to discuss with you this morning.

The CHAIRMAN. We are a Space Committee and we have space problems just as well as the Space Adminisration has space problems.

Dr. DRYDEN. The prime mission of the National Aeronautics and Space Administration, to assure for the United States a position of leadership in space technology, space science, and space exploration, is one of the most challenging, demanding, and urgent that faces the Nation today.

Since it became operative October 1, NASA has had to plan its programs and get them rapidly underway at the same time it has been organizing and staffing for the work ahead. The great difficulties of this task have been aggravated by the fact that today, the Administration is housed in ancient buildings already so overcrowded as to make efficient operation nearly impossible.

NASA urgently needs legislation that will permit it to obtain centrally located, reasonably modern office space that will meet the following requirements.

I might interpolate that the basic legislation authorizes the Agency to lease space anywhere in the world. The District of Columbia, as you know, is exempted by special legislation, so that special authorization is needed within the District of Columbia.

The CHAIRMAN. You have full authority to lease space anywhere else in the world outside of the District of Columbia?

Dr. DRYDEN. That is correct.

The CHAIRMAN. That is an unusual situation.

Dr. DRYDEN. To meet the following requirements:

1. Provide about 120,000 to 130,000 square feet of usable floorspace under one roof to house the present NASA headquarters staff and accommodate the limited staff expansion that will be necessary in the near future.

2. Be centrally located within the Washington downtown area, to facilitate conduct of necessary business with the many other Federal agencies with which NASA cooperates, and with the large number of out-of-the-city scientists, company representatives, and so forth, who have need for frequent face-to-face contact with NASA headquarters staff.

The office space which the NASA presently occupies is hopelessly inadequate to our needs. The General Services Administration has sought to provide additional housing, but the only interim solution possible requires that within the next few weeks, we will be attempting to carry on our headquarters operations from four different locations.

Unfortunately, this method of adding bits and pieces of office space inevitably results in less efficient operation. Organizational

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units which should work closely together are becoming widely scattered and valuable working time is necessarily spent in travel back and forth between the several locations.

Our situation today is one in which too many desks are being jammed into the space available, and the hallways are jammed with working files. Sound levels are so high that, literally, it is too noisy to think—something we have to do, all the time, if we are to do our job as well, as economically, and as rapidly as the Nation requires.

I might talk briefly from the table. The four locations which I have mentioned are 1520 H Street NW., which is the old building of the Cosmos Club, and the Dolly Madison House, which is some hundreds of years old and adapted to offices, and 1512 H Street, which was previously occupied by NACA, and they came over with that organization.

We just began to occupy on February 20, space at 736 Jackson Place, which is on the site of the new Executive Office Building and is scheduled to be torn down in something on the order of 8 months to a year.

Finally, some space is being made available by GSA for occupancy about April 15 in the building at Seventh and D Streets SW. The total square feet of space in these four locations is 94,500 square feet. Without going into full detail on the table, at 1520 H Street NW., there are now 165 employees presently housed. We except to have to put 180 in. With 180 in the building, the square feet per person will be 137.

At 1512 H Street there are presently 180 employees. We can squeeze in perhaps 5 more, making 185, at 118 square feet per person.

At Jackson Place we plan 28 people at 118 square feet per person.

And the building at Seventh and D Streets, 120 people, at 146 square feet per person, a total of 513 people, of whom 45 are employees who will go to Beltsville Space Center, DOD representatives, the Space Committee acting secretary, and so forth; 118 to 140 square feet per person is very low for the type of personnel that we have on the staff.

One further remark in closing; the agency does have some small suggestions for changes in the bill, which are not of major consequence, which are under discussion between the staff and our counsel.

The CHAIRMAN. What will that give you in the way of total employment at this time for the space that you are asking for?

Dr. DRYDEN. 513.

The CHAIRMAN. 513 people?

Dr. DRYDEN. Yes, of whom 468 will be in the NASA headquarters staff. Some housing is also necessary for some people who will later go to Beltsville.

The CHAIRMAN. That will house 513 people here at headquarters?

Dr. DRYDEN. Yes.

The CHAIRMAN. Then that will be how many square feet of space total.

Dr. DRYDEN. That will be in a total floor space of 94,500, of which about 70,000 is usable office space.

The CHAIRMAN. 70,000 is usable?

Dr. DRYDEN. About 70,000 is usable. The total space is 94,500, and we are suggesting that you provide authority so that we can lease about 120,000 to 130,000, which would provide for the expansion that we see during 1960.

The CHAIRMAN. That will fix you up through 1960?

Dr. DRYDEN. Yes.

The CHAIRMAN. Do you have that space in mind now?

Dr. DRYDEN. There is no specific space in mind. There are a number of buildings that are in various states of construction where space is available. Mr. Hodgson is familiar with that.

Mr. HODGSON. That is about as much as we can state on that point, sir.

The CHAIRMAN. You are shopping around for space?

Mr. HODGSON. We are working with GSA, which has the responsibility for identifying space which might meet our needs.

The CHAIRMAN. And what you really want is to place all of your people together?

Dr. DRYDEN. That is right.

Mr. HODGSON. And we can't do a thing until GSA is in a position to make a commitment.

Dr. DRYDEN. May I say, Mr. Chairman, we have just moved across Lafayette Square. The legal staff having to do with patents, the staff having to do with recognition, with awards for inventions and contributions, and within a few days the personnel office will be moved there. Now, the staff dealing with inventions and contributions must rely on the technical staff to help them with technical evaluations. The technical staff at the moment is two blocks away. Some of the groups that will go to Seventh and D are 10 or 15 minutes away.

Mr. MILLER. What is the building on Lafayette Square that you want?

Dr. DRYDEN. It is an old house.

Mr. MILLER. It is a national shrine or something?

Mr. HODGSON. No, sir, it is not that house.

The CHAIRMAN. The corner.

Mr. HODGSON. That is the corner house you are speaking of.

Mr. ANFUSO. Mr. Chairman.

The CHAIRMAN. Mr. Anfuso.

Mr. ANFUSO. Mr. Chairman, I want to go on record as being in favor of H.R. 4913. I am familiar with the plight of the NASA and I believe that you are entitled to what you are requesting.

Mr. FULTON. Mr. Chairman.

The CHAIRMAN. You have to leave and we have your proxy to vote for the measure. One more question and then I will be through with my questioning.

The terms and conditions of the lease are stipulated by General Services?

Mr. ULMER. That is correct.

The CHAIRMAN. They handle all of the negotiations, so the amount that you are authorized to pay for the leased property is normally set by General Services?

Dr. DRYDEN. That is right.

The CHAIRMAN. And we don't have to go into that?

Mr. ULMER. That is correct.

The CHAIRMAN. All you need is the authority to go ahead with negotiations and enter into the lease.

Mr. ULMER. That is correct.

The CHAIRMAN. Now, Mr. Fulton.

Mr. FULTON. I understand H.R. 4913 is to amend section 203(b), subsection 3, under the NASA Act of 1958, and it inserts in there this provision:

including buildings or parts of buildings in the District of Columbia acquired for the administration for use of periods not greater than 10 years.

What is the need for the provision, when the subsection seems to give authority for office space anywhere in the United States?

The CHAIRMAN. Anywhere in the world, but not the District of Columbia.

Dr. DRYDEN. The District of Columbia requires special appropriation plus special language in the authorization bill.

Mr. FULTON. So you could do everything except within the District of Columbia.

Dr. DRYDEN. The lawyers tell me that this does not work; it needs specific authorization.

The CHAIRMAN. I am sure that when this bill was framed last year, as Mr. Fulton remembers, we intended to give to your agency full authority to lease. We didn't know at that time that you would not be covered as to the District of Columbia.

Mr. FULTON. So actually this is just simply a correcting bill in H.R. 4913 to meet the intent of Congress, as prepared by this committee and the Senate committee under section 203(b), subsection 3.

Dr. DRYDEN. It is a perfecting amendment, yes.

Mr. FULTON. And it, in effect, does not give you any extra authority other than what the Congress already thought you had; is that not right?

Dr. DRYDEN. I understood that Congress, in writing this section, intended to give the broad authority, and it was only afterward that I, at least, knew that special authorization was required for the District, regardless of the language that is present in the law there.

The CHAIRMAN. One more question, Doctor. It will not cost any additional money, because you would have this space anyway, but it would be separated at different areas; is that right?

Dr. DRYDEN. Well, this depends on where the rental money is provided in the appropriation. I do not know.

Can you answer this?

Mr. ULMER. At the moment the NASA will probably be required to reimburse GSA for the 1960 rental. In the 1961 budget, the GSA will include this in their own budget and it will drop out of our budget.

The CHAIRMAN. So NASA will really save money in 1961?

Mr. ULMER. Yes.

Mr. FULTON. Could I finish on this legal limit? The limitation as to periods not exceeding 10 years, in the District of Columbia, that is actually a greater period than anywhere in the world.

Dr. DRYDEN. I will ask Mr. Nunn to speak on that.

Mr. NUNN. I am not certain what limitations are imposed on the General Services Administrator with regard to leasing space, Mr. Fulton. Generally speaking, the policy, as I understand it, and the law, as I understand it, requires leases to be limited to 10 years.

Mr. FULTON. That is the point I am making.

Mr. NUNN. That is correct, that is my understanding.

Mr. FULTON. So actually, even with H.R. 4913, you will not be able to purchase any buildings or sites in the District of Columbia?

Dr. DRYDEN. That is correct.

Mr. FULTON. Nor to lease in excess of a period of 10 years under this correcting legislation?

Dr. DRYDEN. That is correct.

The CHAIRMAN. How many employees did you have when you took over on October 1, 1958, as NASA?

Dr. DRYDEN. 180, and they were all housed in 1512 H Street.

Mr. FULTON. And since October 1, 1958, you have added how many new employees in the headquarters staff?

Dr. DRYDEN. 126.

Mr. FULTON. How many employees are there overall in the entire agency at the present time and as of the date of takeover?

Mr. ULMER. Mr. Fulton, we have authority to reach at the end of this fiscal year a total of 8,943 people. We currently have on board 8,359 people. When NASA was established we had 8,034 employees.

Mr. FULTON. So that all through the agency, then, you have added on only how many, including headquarters personnel?

Mr. ULMER. We have added a total of about 325 people since NASA was established.

Mr. FULTON. Of these, how many are in headquarters?

Mr. ULMER. 126.

Mr. FULTON. And of these, how many are administrative or clerical or housekeeping employees, as distinguished from scientific?

Mr. ULMER. I would estimate approximately 30 to 40 percent would be in the administrative and supporting category.

Mr. FULTON. So this is not a tremendous addition of administrative personnel and supporting personnel. It is distributed, is it not?

Dr. DRYDEN. I might say there are certain new activities under the law. For example, I have mentioned the work on patents. NASA had no patent section or patent man. Its work was done by the patent section of the Navy, under agreement. I have forgotten the complement of that particular group. There are seven in the patent work. In public information we had two people. The demands of an agency now living before the eyes of the world have necessitated a considerable expansion in that.

Our procurement activities have been greatly expanded. This accounts for the increase in the headquarters type personnel, plus the organization, of course, of the Space Flight Division under Dr. Silverstein, whom you know.

Mr. FULTON. Has the staff handling the functions of NACA that were taken over, the 8,034, on October 1, 1958, been increased?

Dr. DRYDEN. No, sir.

Mr. ULMER. No; sir; they have not.

Mr. FULTON. Is all of this staff necessary in the District of Columbia, as distinguished from other locations in the country?

Dr. DRYDEN. We think so. It is the operations ordinarily done at headquarters. We do not think that this could be satisfactorily done at a field location.

Mr. FULTON. Well, with various installations under the services being moved out and away from the District of Columbia and being handled very well—for example, the Army Ballistic Missile Agency is at Huntsville, Ala ——

Dr. DRYDEN. That is an operating agency. Our operations correspond more nearly with those carried on in the Secretary of the Army in the Pentagon.

Mr. FULTON. Is it your idea, then, in the future to center your Agency's administration here in the District of Columbia, or near this area?

Dr. DRYDEN. We have a very highly decentralized administration of the line operating activities, and we do our operating activities, on the space side, partly in Jet Propulsion Laboratory, partly at the Beltsville Operating Center, in Maryland, near us.

Mr. FULTON. What will be the total cost of the space you will need to lease during this period?

Dr. DRYDEN. Three-quarters of a million, $800,000 a year.

Mr. FULTON. Is that in line with the amount usually paid per square foot for rental space in this area?

Dr. DRYDEN. This is based on the GSA estimate. I notice by the paper they rented some space recently at $5.50 a square foot.

Mr. HODGSON. This figure was obtained from the GSA regional office, region 3, which handles the District of Columbia space problem.

Mr. FULTON. How much per square foot per year is this?

Mr. HODGSON. This was figured at around $6, including maintenance service.

Mr. FULTON. That sounds pretty high to me for space.

Mr. HODGSON. This includes all of the maintenance services which goes into the space. I am only indicating a figure I got from them which they said was a reasonable figure to use.

Mr. FULTON. My question would then be whether all of these activities, which are vital to the security of this country, should first be concentrated in one area; and second, when office space is getting so high around here, whether we should put a further premium on it by tremendous expansion here.

Dr. DRYDEN. There will be about 500 people in Washington and 9,500 people who will not be in Washington. I don't believe this is a great concentration of the activities of the agency in Washington.

Mr. FULTON. I wouldn't say that on the laboratory and the operations end it was concentrating it here, but it certainly is concentrating it here on the administrative side.

Dr. DRYDEN. The headquarters of most agencies of Government are in Washington.

Mr. FULTON. I am really inquiring, when the price gets up that high, whether it is necessary for a space agency to be crowded in so closely. You must be closely crowded, because I notice in the word "jammed" you left off one of the "m's."

Mr. RIEHLMAN. Would the gentleman yield to me?

Has this contract been discussed with GSA?

Dr. DRYDEN. Yes, GSA has the obligation to provide space for us.

Mr. RIEHLMAN. I understand that. Under Public Law 152, GSA is authorized to procure space for any agencies of the Government in Washington, D.C., as well as throughout the United States of America. The point I am raising is what is the need for this legislation?

Dr. DRYDEN. At present they do not have appropriations authority to rent space for us in the District.

The CHAIRMAN. The District is the only point excepted.

Mr. RIEHLMAN. Do I understand correctly, if this legislation is passed, then GSA will continue to proceed to acquire this space for you?

Dr. DRYDEN. Yes, sir.

Mr. RIEHLMAN. This doesn't give you any additional authority as an agency?

Dr. DRYDEN. That is correct.

Mr. RIEHLMAN. But it gives GSA authority to secure the space?

Dr. DRYDEN. Yes.

Mr. RIEHLMAN. That sounds a bit difficult to me, because under the previous law I can't see why they haven't the authority to get any space that is necesary for any agency in Washington, D.C.

Mr. FULTON. Under Public Law 152?

Mr. RIEHLMAN. That is right.

The CHAIRMAN. Will the gentleman yield?

If you went to Virginia under this legislation, you could go ahead and rent?

Dr. DRYDEN. Yes.

The CHAIRMAN. But when you cross the Potomac and come into the District of Columbia, you need the authority.

Mr. RIEHLMAN. That is not true as far as other agencies are concerned, Mr. Chairman. They rent for the Post Office and any other agency in Washington.

The CHAIRMAN. The difficulty is this, may I say to the gentleman: Under Public Law 85–568, we provided a method for them to lease space, but in providing that method, we left out reference to the District of Columbia. They have a method of leasing space, except for the District of Columbia.

Mr. FULTON. May I ask counsel to clear that up. We do need the authorizing legislation so that there is the authority to do what the gentleman from New York wants, and it is then handled by the particular General Service Administration, and they would have to get the appropriation to do it.

Mr. MILLER. Would the gentleman yield?

The CHAIRMAN. Are you through, Mr. Fulton?

Mr. FULTON. Yes.

The CHAIRMAN. Just to clear this up in my own mind, all we are doing is taking care of an omission in the law, correcting a technicality in the law?

Dr. DRYDEN. That is my interpretation on it.

The CHAIRMAN. Are there any further questions? We want to take a vote before we lose a quorum here. We will let Mr. King have a question.

Mr. KING. Mr. Chairman, I have one question. Perhaps my question would be unnecessary if I knew more about the procedure, but why is it necessary to limit yourself to a lease?

I well understand that that is the standard practice, but is it not possible, when you get into this, you might find that some other arrangement is more advisable, you will have valuable equipment, installations, that will become perhaps affixed to the real estate, that might create some problems, and you might find it much better to acquire by outright grant; and why limit yourself at this time; what purpose does that serve?

Dr. DRYDEN. Well, I think the purpose it serves is this: The NASA is a new agency. It is very difficult to extrapolate 5 years or 10 years ahead. We think it would be better until the general level of activity of the agency in its operations have shaken down to the piont where some estimate can be made as to whether a permanent building should be provided.

Mr. KING. My only question is why shut the door now? You are not committing yourself to purchasing property. Why limit yourself in any way? Why couldn't the bill simply be drafted that you be authorized to make such arrangements as are necessary in the District of Columbia and consistent with existing law?

Dr. DRYDEN. It has been the policy of the Administration and GSA to limit the construction of permanent buildings and to handle situations like ours by lease. The limitation is really a matter of general law and policy and previous actions of Congress, and all of the rest of this.

Mr. KING. Then if you change your mind you will be back in here in another year or two with another bill; is that right?

Dr. DRYDEN. Well GSA might be back with some proposal.

The CHAIRMAN. Any further questions?

Mr. MILLER. I move the bill be reported favorably.

Mr. FULTON. I second the motion.

Mr. DUCANDER. I have an amendment.

The CHAIRMAN. Would you present the amendment, Mr. Ducander? Will you come around here so we can see you?

Mr. DUCANDER. This amendment has been checked with the NASA legal people and it will meet with the approval of NASA, and we believe will also meet with the approval of the Bureau of the Budget.

Strike all after the enacting clause of the bill under consideration and add the following:

That the National Aeronautics and Space Act of 1958, section 203(b)(3) be amended by inserting the following after the semicolon following the phrase "continental United States": "To acquire by lease or otherwise directly or through the assistance of the Administrator of General Services, with or without reimbursement to him, buildings or parts of buildings in the District of Columbia for the use of the Administration for a period not to exceed ten years, without regard to the Act of March 3, 1877 (70) 40 U.S.C. 34".

Mr. MILLER. I move the amendment.

Mr. RIEHLMAN. I would like to ask this question, if I could, Mr. Chairman.

The CHAIRMAN. Go right ahead.

Mr. RIEHLMAN. I wonder if any of the counsel for NASA could tell us whether or not this amendment has been cleared through GSA and has their approval, because they are the ones that are going to be responsible for carrying out this legislation—the General Services Administration.

I don't want to belabor the point, but I think it is important to know that.

Dr. DRYDEN. It has been cleared with GSA in principle.

The CHAIRMAN. And it is cleared with the Bureau of the Budget, so you are safe all around with this amendment.

Are there any further questions?

Mr. FULTON. I move the amendment.

Mr. MILLER. I second the motion.

The CHAIRMAN. It has been moved and duly seconded that we adopt the amendment offered by our director, Mr. Ducander, to H.R. 4913, which has been read to us. All in favor of accepting that amendment make it known by saying "aye."

Opposed.

The amendment is agreed to.

Mr. MILLER. I move the bill be reported favorably with the amendment.

Mr. FULTON. Seconded.

The CHAIRMAN. All those in favor of reporting the bill favorably, H.R. 4913, as amended, will signify by saying "aye."

Opposed.

The bill is reported favorably.

Now, you have with you Mr. Robert G. Nunn, Jr., office of Counsel, Mr. A. S. Hudgson, Director of Management Analysis, and Mr. Ralph Ulmer, Budget Officer. Do they have anything to say? They are all in support of the bill?

Dr. DRYDEN. Yes, sir.

The CHAIRMAN. Do we have any more business this morning?

Mr. DUCANDER. Not this morning, Mr. Chairman.

Tomorrow the committee will have a briefing on basic research in agriculture in this room.

The CHAIRMAN. It is a tremendously interesting briefing. I hope everyone can be present tomorrow. It is a little different phase of our work.

If there is no further business, the committee will be adjourned until tomorrow morning at 10 o'clock.

(Whereupon, at 10:45 a.m., the committee adjourned, to reconvene at 10 a.m., Friday, February 27, 1959.)

The committee reconvened in room 356, House Office Building on March 6, 1959, the Honorable Overton Brooks (chairman) presiding in order to reconsider H.R. 4913.

Mr. DUCANDER. Mr. Chairman, were you overlooking this amendment to H.R. 4913?

The CHAIRMAN. Yes, I was.

It is simply a limitation of the language and not adding anything more to the bill.

Mr. DUCANDER. Indeed that is true.

Mr. FULTON. So it is simply a restrictive clause. I would therefore move it.

The CHAIRMAN. You have heard the motion.

Mr. TEAGUE. I second it.

The CHAIRMAN. All in favor say "aye."

All opposed.

The ayes have it and the amended bill is reported.

(The amendment is as follows:)

That the National Aeronautics and Space Act of 1958, section 203(b)(3) be amended by inserting the following after the semicolon following the phrase "continental United States":

"to acquire by lease or otherwise (directly or), through (the assistance of) the Administrator of General Services (with or without reimbursement to him), buildings or parts of buildings in the District of Columbia for the use of the Administration for a period not to exceed 10 years without regard to the act of March 3, 1877, 40 U.S.C. 34."

Mr. DUCANDER. Mr. Chairman, let the record show that Mr. Robert Nunn and Mr. James Gleason of NASA are here present and have indicated that this amendment is in accordance with the views of NASA, and that Mr. John Fretz of the General Services Administration is here present and has indicated that the amendment just adopted by the committee is according to the views of the General Services Administration.

The CHAIRMAN. Mr. Gleason, that is satisfactory, isn't it, as amended?

Mr. GLEASON. Yes, sir.

The CHAIRMAN. It is, as I say, largely a technical matter. If that is satisfactory to everybody——

Mr. GLEASON. The main thing was to make inoperative the inactive March 3, 1877, Mr. Chairman.

The CHAIRMAN. Thank you, gentlemen, very much, for coming down and assisting us this morning.

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